BIOPAK 240 REVOLUTION

BioPak 240R

Closed-Circuit, Self-Contained Breathing Apparatus

Benchman Manual

CE 1437

A47D257, Revision J
B5-06-6000-23-0
[ECO 9661] March 2013

WARNINGS **4**

1. INTRODUCTION **5**

1.1 Breathable Oxygen 5
1.2 Apparatus Duration 5
1.3 Personnel Training 5
1.4 Servicing 5
1.5 Spare Parts 6

2. APPARATUS DESCRIPTION **7**

2.1 General 7
2.2 Harness 7
2.3 Housing 7
2.4 Breathing Loop 8
2.5 Oxygen Delivery System 8
2.6 Oxygen Cylinder 8
2.7 Alarming System 8
2.8 Facemask 10
2.9 Optional Attachments 10

3. TURN AROUND MAINTENANCE PROCEDURE **12**

3.1 Maintenance Tag 12
3.2 Disassembly 12
3.3 Cleaning/Disinfection 12
3.4 Coolant Canister 13
3.5 Oxygen Cylinder 13
3.6 Facemasks 13
3.7 Assembly 13
3.8 Constant Flow Test 14
3.9 Low Pressure Leak Test 15
3.10 Alarm Test 15
3.11 Upper Housing 16
3.12 Carbon Dioxide Scrubber Pre-Packing Procedure 16

4. LONG TERM MAINTENANCE PROCEDURE **18**

4.1 Visual Inspection 18
4.2 Demand Valve Functional Test 18
4.3 Constant Flow Test 18
4.4 Vent Valve Functional Test 18
4.5 Low Pressure Leak Test 18
4.6 High Pressure Leak Test 18
4.7 Emergency Bypass Valve Functional Test 19
4.8 Alarm Test 19
4.9 Maintenance Tag Validation 19

5. GENERAL SERVICE PROCEDURES **20**

5.1 Scheduled Component Inspection 20
5.2 System Lubrication 20
5.3 Oxygen Cylinder 20
5.4 Alarm Battery Replacement Procedure 21
5.5 Flow Restrictor Replacement Procedure 21
5.6 Factory Service and Training 22

6. STORAGE GUIDELINES **22**

7. PARTS LISTS **23**

7.1 Top Assembly 23
7.2 PRO Facemask Assembly 26
7.3 AV3000 Facemask Assembly 27
7.4 PRO Breathing Hose 28
7.5 AV3000 Breathing Hose 29
7.6 Center Section Lid 30
7.7 Center Section 31
7.8 Diaphragm 33
7.9 Pneumatic Assembly 34
7.10 Manifold Assembly 36
7.11 Alarm Monitor 37
7.12 Oxygen Cylinder 38
7.13 Lower Housing 39
7.14 Ice Canister Freeze Form 41
7.15 Service Kit 42
7.16 Miscellaneous Supplies 44
7.17 Optional Attachments 44

8. APPARATUS SPECIFICATIONS **45**

9. MAINTENACE LOG SHEET **46**

WARNINGS

Please Read Carefully and Fully Understand

This manual is for use by personnel trained in the use and care of compressed oxygen, closed-circuit breathing apparatus, and **MUST NOT** be used as a self-teaching guide by untrained users. Failure to understand or adhere to the **BioPak** User instructions and **BioPak** Benchman manual may result in injury or death.

Biomarine Inc. has taken great care to ensure that the information in the manual is accurate, complete and clear. However, **Training & Technical Support Services** will be pleased to clarify any points in the manual and answer questions on **Biomarine** breathing apparatus.

The following warnings are in accordance with certifying authority requirements and apply to the use of breathing apparatus in general:

- **Breathing apparatus user must be fully trained in the use and care of closed-circuit, self-contained, compressed oxygen breathing apparatus.**
- **Ensure that the selection of the apparatus type is sufficient for the tasks being undertaken and the hazards likely to be encountered. Please refer to National Regulations for guidance.**
- **Adequate protection may not be provided in certain highly toxic atmospheres.**
- **The apparatus must be tested and serviced in accordance with the BioPak 240R Benchman Manual.**
- **The quality of oxygen used to supply and charge the breathing apparatus must be medical or aviation grade oxygen with a moisture content less than 50 mg/m^3 at 207 bar.**
- **Ensure that a good seal can be obtained between the face and facemask. The wearing of beards, side-burns or spectacles may adversely affect the sealing of a facemask to the wearer's face.**
- **The apparatus is not designed for use underwater diving.**
- **The harness must not be used as a vehicle seat or fall arrest restraint.**
- **Replacement of the alarm system battery shall be performed in area atmospheres known to be safe and non-explosive.**
- **The improper use of closed-circuit breathing apparatus carries a risk of carbon dioxide poisoning of user. Users shall be fully trained in recognizing the effects of carbon dioxide poisoning.**
- **Carbon Dioxide Scrubbers must be stored at a temperature between 4^{o}C and 32^{o}C to prevent degradation of the absorbent material.**
- **Carbon Dioxide Scrubbers must be utilized with the supplied Moisture Pad to prevent scrubber canister flooding that may lead to elevated carbon dioxide levels in the breathing gas.**

DISCLAIMER

Failure to comply with these instructions or misuse of the apparatus may result in: death, injury or material damage, and invalidate any warranty or insurance claims.

This manual presents the minimum requirements for BioPak utilization.

1. INTRODUCTION

1.1 Breathable Oxygen

Oxygen used to supply or charge the breathing apparatus must be medical or aviation grade oxygen with moisture content less than 50 mg/m^3 at 207 bar. The composition of suitable oxygen is given below and provides the maximum level of contaminates in the source oxygen acceptable for use in the BioPak.

Oxygen: 99.5% minimum mole
Carbon Dioxide: 300 ppm maximum
Carbon Monoxide: 10 ppm maximum

The purity/quality of oxygen used to supply and charge breathing apparatus should be tested periodically in accordance with national regulations.

National regulations must be observed.

Personnel dealing with compressed oxygen and compressed oxygen cylinders must be fully trained in the use and handling of compressed oxygen.

1.2 Apparatus Duration

The apparatus will provide the user with 440 liters of compressed oxygen and has been rated for a 4-hour duration based upon machine testing at a breathing rate of 30 liters/minute according to specifications of EN145. Actual duration of the apparatus will vary to factors such as:

- Workload: high work rates will increase consumption rates of oxygen.
- Facemask Seal: poor seal of mask will result in system leaks and high oxygen consumption rates.
- Physical Fitness of Wearer
- System Leaks: leaks in the BioPak system will result in high oxygen consumption.

It is important that all wearers are aware of the above factors and take account of them when assessing BioPak duration.

It is equally important that all wearers understand that the BioPak 240R respirator is a positive-pressure apparatus. Leaks in the apparatus itself or in the seal between the wearer's face and the facemask will lead to the apparatus adding additional oxygen to maintain positive pressure.

1.3 Personnel Training

Personnel who use closed-circuit, self-contained, positive-pressure, compressed oxygen breathing apparatus must be fully trained in accordance with these instructions and national regulations.

These instructions cannot replace an accredited training course provided by qualified instructors in the proper and safe use of **Biomarine** breathing apparatus.

Please contact **Training & Technical Support Services** or your local distributor for training course details.

1.4 Servicing

The BioPak 240R must be serviced at scheduled intervals by qualified Benchman personnel who have completed a formal training course and hold a current certificate for the service and repair of **Biomarine** breathing apparatus.

Turn Around Maintenance shall be performed after each use of the BioPak 240R as detailed in the **BioPak 240R Benchman Manual**.

Long Term Maintenance must be performed on a monthly basis, if the BioPak is in constant use; or, on a quarterly basis if the BioPak is being used less than once per month, as defined in the **BioPak 240R Benchman Manual**.

Electronics Intrinsic Safety Assessment Procedure must be performed each time the batteries are replaced in the alarming system as defined in the **BioPak 240R Benchman Manual.**

Benchman training and service contracts can be provided by contacting **Training & Technical Support Services.**

1.5 Spare Parts

Spare parts, accessories, general information and factory service can be obtained by contacting **Training & Technical Support Services.**

Reference details provided in the **BioPak 240R Benchman Manual** concerning spare part identification, accessory identification and BioPak factory service.

Training & Technical Support Services:

Biomarine Inc.
456 Creamery Way
Exton, PA 19341
United States of America

Tel: +1 610.524.8800
Fax: +1 610.524.8807
Web: BioPak240r.com

Customers can also contact their **local authorized Biomarine Distributor** for training, product support, service or maintenance.

Reference documentation supplied with sales order for standard terms of warranty.

2. APPARATUS DESCRIPTION

2.1 General

BioPak 240R is a closed-circuit, positive-pressure, self-contained breathing apparatus (CCBA) for use in long-duration missions into atmospheres that are immediately dangerous to life and health (IDLH). Applications will include mine rescue, fire-fighting, confined space entry, domestic preparedness, military, tunnel rescue and HAZMAT.

All versions of the **BioPak 240R** feature a backpack-style housing that is worn over the shoulders and hips of the wearer. A pressure gauge is supplied to indicate remaining stores of oxygen and two visual alarms and one audible alarm is provided for system status.

The closed-circuit design will recycle the wear's exhalation breath by removing carbon dioxide, replacing consumed oxygen, trapping condensation and cooling the breathing gas.

The positive-pressure design will maintain internal breathing gas pressures slightly above external atmospheric pressure. This feature will provide increased protection against the inward migration of external toxins to the wearer.

All external housing components are static dissipative and flame retardant.

BioPak 240R is approved to the following European Standards:

- EN 136:1998 Respiratory protective devices - Full face masks
- EN 145:2000 Respiratory protective devices – Self-contained, closed-circuit breathing apparatus compressed oxygen type
- Directive 97/23/EC Pressure Equipment Directive
- EN 60079-0:2009/08/01 Electrical apparatus for explosive gas part 0: General Requirements
- EN 60079-11:2007/01/01 Explosive Atmospheres-Part11: Equipment protection by intrinsic safety "I"
- EN 60079-26:2007/03/01 Explosive Atmospheres-Part 26: Equipment with protection level (EPL) GA
- IEC 60079-0:2007/10/01 Ed:5 Explosive Atmospheres-Part 0:equipment-General Requirements
- IEC 60079-11:2006/07/01 Ed:5 Explosive Atmospheres-Part 11: Equipment protection by intrinsic safety "I"; CORR 2006/12/08
- EN 60079-26:2006/08/01 Ed:2 Explosive Atmospheres-Part 26; Equipment with protection level (EPL) GA

BioPak 240R is "CE" marked in accordance with EEC Directive 89/686/EEC.

BioPak 240R Monitor is marked
Ex ia I/IIC T4 Ma/Ga
$-20^{o}c <+ Tamb <+ +60^{o}c$

NOTIFIED BODIES:

Central Institute for Labour Protection
(Notified Body No. 1437)
Wierzbowa 48
90-133 Lodz, Poland

Intertek Testing & Certification Ltd
Intertek House, Cleeve Road
Leatherhead, Surrey KT22 7SB
United Kingdom

TUV America, Inc.
Industry Service
5 Cherry Hill Drive
Danvers, MA 01923
United States of America

Please contact **Biomarine Inc.** for further apparatus approval details.

2.2 Harness

The **BioPak** harness is provided as a padded harness to increase wearer comfort. The flame-retardant harness is manufactured from Kevlar™ and Nomex™ materials with stainless steel hardware. The harness is attached directly to the apparatus via locking stainless steel screws.

2.3 Housing

The backpack-style housing is injection molded from a flame-retardant polycarbonate/stainless steel alloy that provides light weight, high strength and static dissipation. The housing consists of a lower portion and an upper portion that

snaps together in a secure fashion without the need for connection hardware.

2.4 Breathing Loop

The breathing loop consists of the breathing chamber, breathing hoses, facemask connector and facemask.

The breathing chamber consists of the center section, center section lid and diaphragm. The spring loaded diaphragm will maintain positive pressure within the apparatus. All oxygen gas additions will occur within the breathing chamber as well as over pressure venting. Carbon dioxide is removed from exhalation gas by the carbon dioxide scrubbers located within the breathing chamber. Excessive moisture will be retained by the moisture containment sponges located within the center section. Inhalation breathing gas cooling will be achieved as the gas travels around the two coolant canisters of the breathing chamber.

2.5 Oxygen Delivery System

Oxygen will be delivered from the oxygen cylinder to the breathing loop through a pressure regulator and manifold system in one of three different methods.

Pressure demand oxygen additions are provided whenever the diaphragm of the breathing chamber reaches the upper level of its travel and depresses the demand valve plunger. Additions will be made at 80 liters/minutes whenever the demand valve plunger is depressed. Pressure demand additions occur whenever the wearer consumes more oxygen than is supplied by the constant add.

Constant add oxygen additions are continually added to the breathing loop at an average rate of 1.8 liters/minute. This oxygen addition rate is equivalent to the oxygen consumption rate of a wearer at a moderate work rate.

Emergency add oxygen additions occur whenever the wearer depresses and holds the red emergency bypass button. This add will provide 80-100 liters/minute of oxygen flow and is utilized only for emergency situations.

2.6 Oxygen Cylinder

The oxygen cylinder is a fully wrapped aluminum carbon fibre composite cylinder that is secured into the apparatus via connection to the pressure regulator and a hold down strap. The cylinder will provide containment of the oxygen supply at a 207 bar to provide 440 liters of breathable oxygen to the wearer.

2.7 Alarming System

The alarming system consists of a pneumatic pressure gauge and an electronic monitor to provide the wearer with independent and redundant system status indications.

The pressure gauge is mounted on the harness and retained by a snap strap and magnet. Remaining stores of oxygen will be indicated on the gauge and a red band of color will indicate to the wearer when oxygen stores have reached 25% of capacity. The pressure gauge is protected against sudden loss of oxygen stores in the event of gauge line severing by a manual disconnect located at the gauge pass through point of the housing.

The electronic monitor will provide the wearer of indications of system status as listed below through the LED located on the pneumatic pressure gauge and via an alarm horn located on the monitor package.

Condition	Alarm Action
System Ok	Flashing **Green**
System Fault	Flashing **Red** Horn Sounding
End of Service Life	Flashing **Red** Horn Sounding
Ice Reminder	Flashing **Blue**
Low Battery	Flash **Red, Green, Blue** Horn Sounding

2.8 Facemasks

BioPak 240R is approved for use with the **PRO** and **AV3000** full facemasks, all of which conform to EN136, Class 3.

All facemasks are provided with five point, fully adjustable head harnesses.

To prevent fogging during use, the internal surface of the facemask lens is covered with a permanent anti-fog film that will not require the application of any anti-fog spray or wipe.

All facemasks connect to the apparatus via a push button, bayonet hose connection.

Speech diaphragms are provided to allow verbal communication and all masks are provided with a magnetic wiper the is for optional user utilization.

The polycarbonate visors of all facemasks conform to EN 166, Grade B for impact resistance.

PRO Mask

AV3000 Mask

2.9 Optional Attachments

- Hydration systems provide the wearer with a source of drinking liquid without breaking the seal of the breathing loop to the external atmosphere.

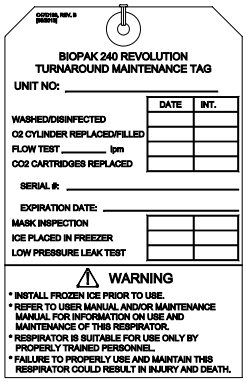
- Anti-crush rings provide breathing hose crushing and restriction protection.

- Kevlar™ breathing hose covers provide additional abrasion protection to breathing hoses.
- Radiant heat guards provide additional breathing hose protection against high radiant heat and direct flame contact.

- Phase Change Module (PCM) provides cooling to the breathing gas when ice coolant is not utilized. Note that the PCM **is required** when the ice coolant is not utilized.
- Contact **Biomarine** or your local distributor for additional details and supply of optional attachments.

3. Turn Around Maintenance Procedure

3.1 Maintenance Tag


BIOPAK 240 REVOLUTION
TURNAROUND MAINTENANCE TAG
UNIT NO: _____

	DATE	INT.
WASHED/DISINFECTED		
O2 CYLINDER REPLACED/FILLED		
FLOW TEST _____ lpm		
CO2 CARTRIDGES REPLACED		

SERIAL #: _____

EXPIRATION DATE: _____

MASK INSPECTION		
ICE PLACED IN FREEZER		
LOW PRESSURE LEAK TEST		

⚠ WARNING

* INSTALL FROZEN ICE PRIOR TO USE.
* REFER TO USER MANUAL AND/OR MAINTENANCE MANUAL FOR INFORMATION ON USE AND MAINTENANCE OF THIS RESPIRATOR.
* RESPIRATOR IS SUITABLE FOR USE ONLY BY PROPERLY TRAINED PERSONNEL.
* FAILURE TO PROPERLY USE AND MAINTAIN THIS RESPIRATOR COULD RESULT IN INJURY AND DEATH.

Obtain a maintenance tag as supplied with replacement carbon dioxide scrubbers.

The maintenance tag shall be completed as directed in this procedure and then attached to the waist belt of the apparatus to show completion of all maintenance steps.

Record the apparatus identification onto the tag.

3.2 Disassembly

Immediately after completion of BioPak use, remove the used CO2 scrubber canisters, scrubber moisture pad and disconnect the demand and constant add lines to the center section to prevent migration of moisture into the manifold assembly.

Disassemble the apparatus to ready for cleaning and disinfection. Note any apparatus damage and repair as needed. Repairs beyond the scope of the Benchman should be referred to **Biomarine.**

1. Remove the upper housing.
2. Remove the coolant lids and coolant ice.
3. Remove the oxygen cylinder, making sure the seal washer remains in place, and install the regulator wash cover supplied with the service kit.

It is acceptable to leave the oxygen cylinder in place until after washing and disinfecting has been completed to prevent the ingress of contaminants into the high pressure plumbing of the BioPak.

4. Remove the facemask adapter from the breathing hoses.
5. Remove the breathing hoses from the breathing chamber.
6. Remove the center section lid.
7. Remove and discard the two carbon dioxide scrubbers and the scrubber moisture pad.
8. Remove the moisture sponges and the PCM if used.
9. Disconnect the electrical line and both pneumatic connections to the center section. Use care when handling the center section. Avoid sharp objects and rough surfaces that could damage the rubber diaphragm.
10. Remove the four quarter-turn fasteners and remove the center section.

3.3 Cleaning/Disinfection

Use only cleaners and disinfectants that are approved by **Biomarine.**

The apparatus must be cleaned and disinfected as soon as possible after each use. If cleaning is not immediately possible after use, at a minimum remove and discard the carbon dioxide scrubber and moisture pad, remove the moisture control foam pads and temporarily store the BioPak with the center section lid open to prevent the growth of mold or mildew.

DO NOT submerge the electronic monitor housing.

DO NOT allow any fluids to contact the input port of the pressure regulator.

1. Clean the upper and lower housings, ice canisters and coolant lids and all connected components with a mild soap and water mixture if necessary.
2. Mix the disinfectant with clean water as directed on the package.
3. Submerge the facemask, hoses with facemask connector, center section lid, center section, PCM and moisture sponges into the disinfectant solution. Allow the components to be wetted on all surfaces for a minimum of 10-minutes.

Install a Demand Port Wash Plug, supplied with the service kit, to the demand port of the center section to

keep water from migrating in the demand housing.

Do NOT allow the mask to soak in cleaning solutions for extended periods. Extended soaking can cause delamination of the anti-fog film.

4. **Thoroughly** rinse all components in clean water to remove all disinfection solution. **It is extremely important to fully rinse the facemask of all cleaning solution.**
5. Allow all components to dry either by air-drying, heated drying or through the use of a dryer system. Heat assisted drying temperatures shall not exceed 50°C.
6. Date and initial the maintenance tag under *Washed/Disinfected.*

3.4 Coolant Canister

The coolant canisters must be frozen before use.

1. Place the cleaned and dried canisters into the freeze form and tighten the nuts securely.
2. Place the freeze forms onto a level surface in a freezer for a minimum 8-hour period at a temperature of -12°C or less.
3. Date and initial the maintenance tag under *Ice Placed in Freezer.*
4. **If the frozen ice canisters are not going to be utilized in the BioPak,** do not date and initial the maintenance tag.

3.5 Oxygen Cylinder

The oxygen cylinder must be fully charged with oxygen before use.

Oxygen used to supply or charge the breathing apparatus must be medical or aviation grade oxygen with moisture content less than 50 mg/m^3 at 207 bar. The composition of suitable oxygen is given below.

Oxygen: 99.5% minimum mole
Carbon Dioxide: 300 ppm maximum
Carbon Monoxide: 10 ppm maximum

The purity/quality of oxygen used to supply and charge breathing apparatus should be tested periodically in accordance with national regulations.

National regulations must be observed.

Oxygen will enhance the combustion of other materials. Personnel dealing with compressed oxygen and compressed oxygen cylinders must be fully trained in the use and handling of compressed oxygen.

1. Obtain the proper cylinder fill adapter needed to connect the oxygen cylinder to the booster pump.
2. Connect the cylinder to the booster pump and charge to 207 bar pressure with medical or aviation grade oxygen.

3.6 Facemask

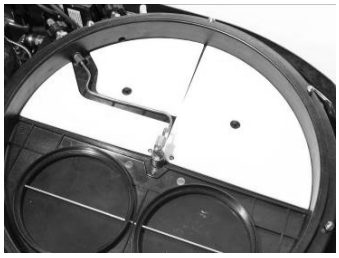
1. Inspect the components of the facemask and replace as required.
2. Reinstall the magnetic wiper to facemask if utilized.
3. Date and initial the maintenance tag under *Mask Inspection.*

NOTE: The mask is supplied with a permanent anti-fog film so no application of anti-fog agents of any kind are required.

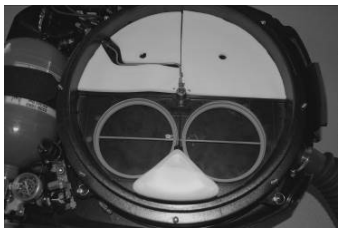
3.7 Assembly

1. Position the BioPak in a level position, as depicted above, by propping up the handle end of the lower housing.
2. Install the center section making sure to properly seat the three springs onto the diaphragm.
3. Lock the center section into position using the four quarter-turn fasteners.

4. Connect the electrical and pneumatic lines to the center section. Verify the presence of an o-ring seal on each pneumatic line connection.
5. Position the fully dry moisture sponges into the center section. The sponges must be fully dry to prevent the growth of mold within the apparatus.



6. If utilized, install the PCM into the breathing chamber opposite the moisture sponges. Date and initial the maintenance tag under *Ice Placed in Freezer* and enter "PCM" on the tag.



7. Install the center section lid and latch to secure. If pre-packing the carbon dioxide scrubbers complete section 3.12 then return to step 7 of this section.
8. Install the breathing hoses to the breathing chamber and secure with clamps making sure the flow direction arrows of the connector are facing up.
9. Install the storage plug into the facemask connector.
10. Install the oxygen cylinder and secure with the hold down strap.

3.8 Constant Flow Test

1. Disconnect the constant add feed line to the center section (green-colored line) and connect the test flowmeter from the service kit to the open end of the feed line.

2. Open the oxygen cylinder valve and observe flowmeter while holding it in a vertical and level position. The flowmeter shall indicate a flow as per the table below when reading the center of the flowmeter ball. The table provides flow readings for elevations of sea level to 1600 meters and above 1600 meters.

If the flow does not meet the requirements of the table below, the flow restrictor will need replacement.

Cylinder Pressure, bar	**Flow 0-1600m, lpm**	**Flow > 1600m, lpm**
100-150	1.8-2.4	1.9-2.6
150-207	1.9-2.5	2.0-2.8

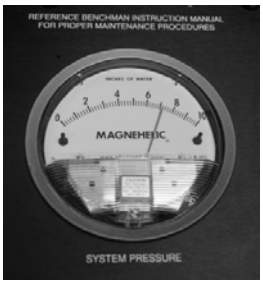
3. Enter the measured flow rate, date and initial the maintenance tag under *Flow Test____ lpm.*
4. Close the oxygen cylinder valve, remove the test flowmeter and reconnect the constant add feed line to the center section.

3.9 Low Pressure Leak Test

1. Remove the storage plug from the breathing hoses and install the leak test adapter from the service kit.

2. Attach rubber tubing from the service kit between the leak test adapter and the input port of the service kit.

3. Insert two test keys from the service kit in the keyholes in the back of the lower housing.
4. Open the oxygen cylinder valve and depress the bypass valve until the test kit displays a pressure just under 7 mbar (3.5” water column), then immediately close the oxygen cylinder valve.



5. Activate the emergency bypass valve to empty all gas into the breathing chamber and raise the pressure reading to between 15 and 20 mbar (6 and 8” water column). **DO NOT** overpressure.
6. After the test gauge stabilizes, note the exact pressure reading of the service kit and allow the apparatus to sit undisturbed for 60-seconds. The apparatus pressure shall not drop more than 0.5 mbar (0.2” water column) in the 60-second period.

If the oxygen cylinder is not closed the pressure reading will continue to rise and potentially damage the breathing chamber.

If the apparatus pressure drops more than 0.5 mbar (0.2”) in the 60-second there is a leak that must be located and repaired.

7. Open the service kit bleed valve and/or remove the leak test adapter to vent the apparatus.
8. Replace the storage plug.
9. **Remove the two test keys from the rear of the lower housing.**
10. Date and initial the maintenance tag under *Low Pressure Leak Test.*

3.10 Alarm Test

1. While observing the pressure gauge and TRIM indicator, open the oxygen cylinder valve. The cylinder must be filled with a minimum of 100 bar pressure for this test.
2. When the oxygen cylinder is opened the TRIM indicator shall cycle **RED**, **GREEN**, **BLUE** with the horn sounding. The TRIM will then flash **GREEN** and the horn will be silent.
3. The pressure gauge will reach full reading in approximately 60-seconds.
4. Close the oxygen cylinder and allow the BioPak to slowly reduce pressure while observing the pressure gauge and LED indications. The LED indication should turn to a flashing red with a horn sounding when the pressure gauge reads between 45-69 bar. The LED indication will cease when the pressure gauge reads under 1.7 bar.
5. Verify that the oxygen cylinder is fully charged to 207 bar and top off if necessary.
6. Date and initial the maintenance tag under *O2 Cylinder Replaced/Filled.*

3.11 Upper Housing

1. Replace the upper housing onto the apparatus.
2. If the carbon dioxide scrubbers have not been installed into the apparatus then leave the maintenance tag *CO2 Cartridges Replaced* field blank.

See section 3.12 concerning procedures for pre-packing the carbon dioxide scrubber into the apparatus during turn around maintenance.

3. Tie the completed maintenance tag across the waist belt connector or the carrying handle of the apparatus.

3.12 Carbon Dioxide Scrubber Pre-Packing Procedure

The Biomarine carbon dioxide scrubbers can be pre-packed into the apparatus during turn around maintenance if so desired.

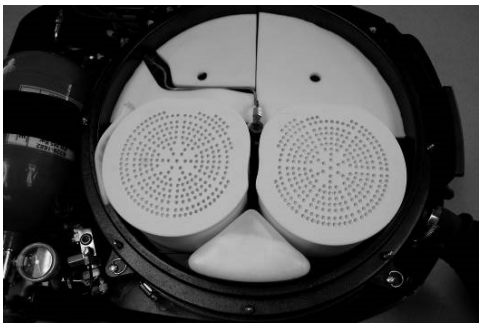
Pre-Packing the BioPak 240R with the carbon dioxide scrubbers is only permitted when utilizing OrbSorb® carbon dioxide scrubber.

Pre-packed carbon dioxide scrubbers may only be stored in the apparatus for a period no long than 1-year.

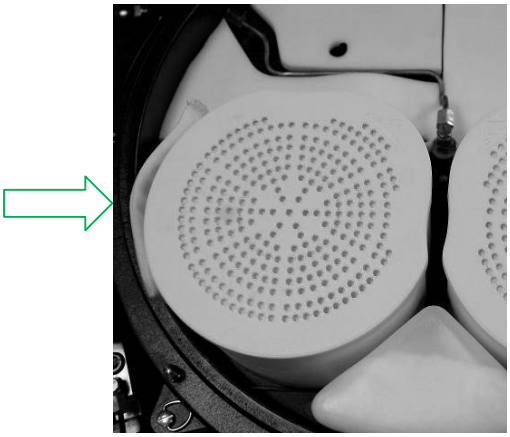
Apparatus that are pre-packed with the carbon dioxide scrubber shall be stored within the specified storage temperature and humidity levels and must be sealed air-tight in the apparatus.

Moisture sponges must be installed dry when pre-packing the BioPak.

1. Inspect the expiration date of the carbon dioxide scrubber to ensure that it is not expired. Record the carbon dioxide scrubber serial number and expiration date on the maintenance tag or affix the scrubber label to the back of the tag.
2. Verify that each carbon dioxide scrubber canister has an o-ring installed.
3. Install two carbon dioxide scrubber canisters into the breathing chamber making sure that they are properly aligned and fully seated into position as depicted below. Position each canister so that the top indicator arrow is pointing to the center of the breathing chamber.



4. Remove the moisture pad, depicted below in sealed bag, from the sealed pouch and install it into the breathing chamber as depicted. Do not allow the pad to become pinched between the breathing chamber wall and the scrubber. The pad shall be located right next to the baffle opening that leads to the coolant canisters.



Proper moisture pad installation.

WARNING: Failure to install the moisture pad can lead to scrubber flooding that will result in elevated carbon dioxide levels in the breathing gas that may lead to injury or death.

5. Install and secure the breathing chamber lid.
6. Date and initial the maintenance tag under *CO2 Scrubber Replaced.*

The expiration date of pre-packed carbon dioxide scrubbers will be the shorter time period between the following two factors:

1-year from date of scrubber installation into BioPak; or,

“Use By” date provided on packaging of carbon dioxide scrubber.

4. Long Term Maintenance Procedure

In addition to normal turn around maintenance, the apparatus shall be visually inspected and pressure tested on a monthly basis, if the apparatus is being used at least once per month; or, quarterly, if the apparatus is used less than once per month or is in long term storage.

BioPaks that have been placed in long term storage should have the Long Term Maintenance Procedure conducted every 6-months.

A Maintenance Log Sheet is provided in this manual to assist in tracking long-term maintenance procedures.

4.1 Visual Inspection

Remove the upper housing and visually inspect the apparatus for signs of wear, abuse, loose connections or other damage. Repair as necessary.

Verify that the apparatus is properly sealed against the ambient environment by the presence of the storage plug.

4.2 Demand Valve Functional Test

1. Open the oxygen cylinder and listen for the sound of gas escaping into the breathing chamber. The sound will last approximately 1-3 seconds. This signals that the demand has properly opened.
2. After 1-3 seconds the sound of gas escaping into the breathing chamber should cease. This signals that the demand valve has properly closed.

4.3 Constant Flow Test

1. Perform the test as described in Section 3.8.

4.4 Vent Valve Functional Test

1. Fill the apparatus by depressing the emergency bypass valve in several short bursts. Observe the pressure reading on the service kit. The apparatus pressure should remain at or below 5 mbar (2” water column) pressure after releasing the emergency bypass valve.

4.5 Low Pressure Leak Test

1. Perform the test as described in Section 3.9.

4.6 High Pressure Leak Test

1. Place the apparatus on a flat surface. Ensure that the test keys of the Low Pressure Leak Test have been removed.
2. Open the oxygen cylinder valve and wait until the apparatus pressure gauge has reached its final reading.

3. Inspect each plumbing connection with oxygen safe leak detection fluid by wetting each joint, waiting 60-seconds, then inspecting each joint for the sign of bubble formation. The presence of bubbles will indicate a leak.
4. Repair any leaking joint or replace the leaking components.
5. Close the oxygen cylinder valve and depress the emergency vent valve to depressurize the apparatus.

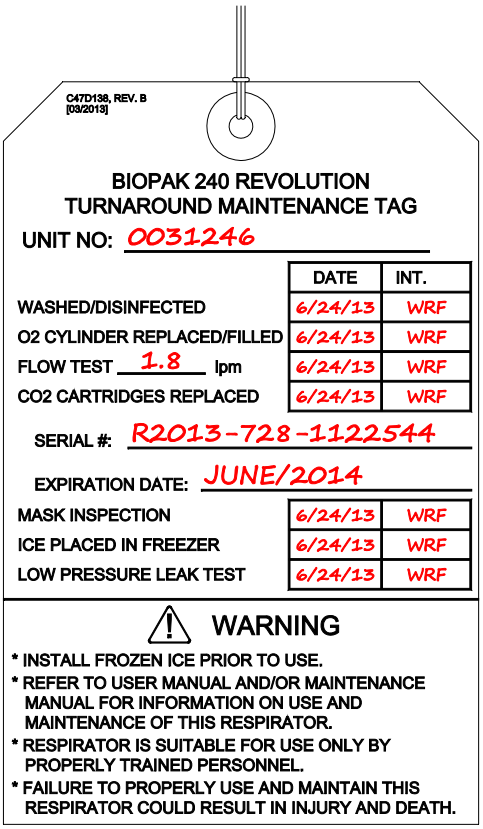
4.7 Emergency Bypass Valve Functional Test

1. Open the oxygen cylinder and depress the emergency bypass valve for 1-2 seconds. The of gas escaping into the breathing shall be heard whenever the valve is depressed and shall cease whenever the valve is released.
2. Close the oxygen cylinder.

4.8 Alarm Test

1. Perform the test as described in Section 3.10.

4.9 Maintenance Tag Validation


C47D138, REV. B
[03/2013]

BIOPAK 240 REVOLUTION
TURNAROUND MAINTENANCE TAG

UNIT NO: 0031246

	DATE	INT.
WASHED/DISINFECTED	6/24/13	WRF
O2 CYLINDER REPLACED/FILLED	6/24/13	WRF
FLOW TEST 1.8 lpm	6/24/13	WRF
CO2 CARTRIDGES REPLACED	6/24/13	WRF

SERIAL #: R2013-728-1122544

EXPIRATION DATE: JUNE/2014

MASK INSPECTION	6/24/13	WRF
ICE PLACED IN FREEZER	6/24/13	WRF
LOW PRESSURE LEAK TEST	6/24/13	WRF

WARNING

* INSTALL FROZEN ICE PRIOR TO USE.
* REFER TO USER MANUAL AND/OR MAINTENANCE MANUAL FOR INFORMATION ON USE AND MAINTENANCE OF THIS RESPIRATOR.
* RESPIRATOR IS SUITABLE FOR USE ONLY BY PROPERLY TRAINED PERSONNEL.
* FAILURE TO PROPERLY USE AND MAINTAIN THIS RESPIRATOR COULD RESULT IN INJURY AND DEATH.

1. Inspect the maintenance tag that should be attached to the apparatus waist belt or carrying handle. Verify that all portions of the tag are properly completed.
2. Verify that the apparatus oxygen cylinder is fully charged to 207 bar and top off if necessary.
3. Replace the upper housing.

5. General Service Procedures

5.1 Scheduled Component Inspection

Breathing Diaphragm:

Annually, remove the center section and disconnect the diaphragm from the center section by loosening the clamp. Inspect the diaphragm for signs of wear, cracking or rot. Disassemble the vent valve and inspect all components and lubricate as needed. Reference the parts list for proper diaphragm alignment.

Diaphragm Alignment: Proper diaphragm alignment is depicted below. Note the positioning of the three large holes in the diaphragm plate in relation to the breathing chamber mounting feet and the breathing hoses. Reference diagram in Section 7.8.

Facemask: Inspect all rubber components for signs of wear, tears, rips, cracking or rot.

Breathing Hoses: Inspect for signs of wear, tears, rips, cracking or rot.

O-ring Seals: If the apparatus has passed the high and low pressure leak tests the o-ring integrity is acceptable. It is recommended to perform full system lubrication on an **annual** basis. Otherwise inspect o-rings at intervals of:

O-Ring Description	Uses or Age
Center Section	25 uses annually
Vent Valve	50 uses annually
Other	annually

5.2 System Lubrication

Leaks discovered during high and low pressure testing are often caused by damaged or improperly lubricated o-rings. Replace faulty o-rings and follow the guides below for o-ring handling and lubrication.

- Never pry o-rings from glands with a screwdriver. Remove o-rings by hand or using the pick tool provided in the service kit.
- Unless otherwise directed, do not lubricate o-rings while they are still seated within their gland.
- Do not use heavy coats of lubrication. Proper o-ring lubrication will result in a shiny surface without lumps.
- Do not stretch or deform o-rings during handling.
- Visually and by feel, inspect o-ring for signs of damage such as nicks, cuts, tears or abrasion.
- Christo-Lube™ and Dow 111™ are the only lubricants approved for use in the apparatus.
- **NEVER** lubricate the sealing washer that sits between the oxygen cylinder and the pressure regulator.

5.3 Oxygen Cylinder

The cylinder should be inspected regularly for signs of damage to the outer wrapping. Cylinders that are cracked, flaking or show exposed fibres should be immediately retired from service.

Cylinders will require periodic hydro-static testing per national requirements. Typical intervals are every 5-years from the date of manufacture. Cylinder testing should be conducted by an authorized testing facility.

Cylinders that have been hydro-static tested shall be cleaned for high-pressure oxygen service as per national standards.

Cylinders are to be retired from service 15-years after the date of manufacture.

5.4. Alarm Battery Replacement Procedure

The alarm system battery shall be replaced after 200-hours of use, after 6-months or after the alarm system low battery alarm (**RED**, **GREEN**, **BLUE** flashes with corresponding horn sounding), whichever occurs first.

Battery replacement can only be performed in an area known to contain non-hazardous (non-explosive) atmospheres.

1. Remove the upper cover.
2. Disconnect the electrical line to the center section.
3. Use two 7/16” wrenches from the service kit to remove the light guide from the alarm monitor housing. **DO NOT** allow the fitting anchored to the alarm housing to rotate.
4. Remove the alarm housing from the apparatus. Inspect the housing for cracks or damage. Dust-tight and water-tight integrity are required for use in potentially explosive atmospheres. **The alarm module will require replacement if any damage to the housing is discovered.**
5. Remove the battery cover. Inspect the cover and gasket for cracks or damage. **The battery cover door will need to be replaced if any damage is found.**
6. Remove the battery from the alarm housing and replace with a fresh battery. Inspect the interior of the battery compartment for the presence of corrosion, liquid or dust. Clean if necessary or replace the alarm module.

Use only battery types as specified for replacement.

7. Replace the battery cover making sure that the gasket is properly positioned and that the gasket is not damaged in any way.
8. Install the alarm housing into the apparatus.
9. Use two 7/16” wrenches from the service kit to install the light guide from the alarm monitor housing. **DO NOT** allow the fitting anchored to the alarm housing to rotate.
10. Connect the electrical line from the center section to the alarm housing.
11. Conduct the Alarm Test as described in section 3.10.
12. Install the upper housing.

5.5 Flow Restrictor Replacement Procedure

1. Remove the upper housing.

2. Use the ¼” hex driver from the service kit to the remove the flow restrictor.
3. Use the ¼” hex driver from the service kit to the install a replacement flow restrictor.
4. Perform the high-pressure leak test as directed in long term maintenance.
5. Perform the constant add test as directed in turn around maintenance.
6. Replace the upper housing.

5.6 Factory Service and Training

Factory service and personnel User and/or Benchman Training can be provided by contacting the location listed below or by contacting your local Biomarine Dealer or Distributor.

Biomarine, Inc.
ATTN: Service Department
456 Creamery Way
Exton, PA 19341-2532
USA

Tel: (610) 524-8800, ext. 123
Fax: (610) 524-8807
Web: www.BioPak240r.com

Contact **Biomarine** prior to returning any equipment.

To better serve your needs, please provide the following information when contacting **Biomarine**.

- Apparatus Model Number
- Apparatus Serial Number
- Date of purchase
- Approximate number of uses
- Description of problem
- Actions taken to correct problem
- Contact name, address and phone number with area or country code and email address
- **Please** provide your current email address with all service correspondence.

6. STORAGE GUIDELINES

Follow the guidelines below for proper storage of the apparatus.

- Storage plug **shall** be installed.
- Never store a wet apparatus. The apparatus **must** be fully dry before storage to prevent the growth of mold and bacteria.
- **Never** store an apparatus that has not been fully cleaned and disinfected.
- Store in a location free from impact that could cause damage to the apparatus.
- Store in the stated conditions of ambient temperature, relative humidity and air pressure.
- Store in a location that will not submerge the apparatus.
- Carbon Dioxide Scrubbers **must** be stored within the temperature limits of 4^{o}C to 32^{o}C.

7. PARTS LIST

7.1 Top Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	--	B7-07-2403-00-0	BioPak 240R Respirator, EN/FR/BW/b/PRO[1]
REF	--	B7-07-2403-01-0	BioPak 240R Respirator, EN/FR/BW/p/PRO[1]
REF	--	B7-07-2403-02-0	BioPak 240R Respirator, EN/FR/BW/MPa/PRO[1]
REF	--	B7-07-2403-03-0	BioPak 240R Respirator, EN/FR/G/b/PRO[1]
REF	--	B7-07-2403-04-0	BioPak 240R Respirator, EN/FR/G/p/PRO[1]
REF	--	B7-07-2403-05-0	BioPak 240R Respirator, EN/FR/G/MPA/PRO[1]
1a	1	B6-02-5003-09-1	PRO PP Facemask-Small[2], *See Section 7.2*
1b	1	B6-02-5003-09-0	PRO PP Facemask-Medium[2], *See Section 7.2*
1c	1	B6-02-5003-21-1	PRO PP Facemask-Small with Drink Port[2], *See Section 7.2*
1d	1	B6-02-5003-21-0	PRO PP Facemask-medium with Drink Tube[2], *See Section 7.2*
1e	1	B6-02-5002-09-3	AV3000 Facemask-Small[2], *See Section 7.3*
1f	1	B6-02-5002-09-4	AV3000 Facemask-Medium[2], *See Section 7.3*
1g	1	B6-02-5002-09-5	AV3000 Facemask-Large[2], *See Section 7.3*
2	1	B6-02-5002-18-0	Upper Housing Assembly
3	2	B2-02-4000-39-0	Coolant Lid
4	2	B6-02-5002-37-0	Ice Canister
5	2	B2-02-7001-09-0	Breathing Hose, *See Section 7.4 or 7.5*
6	1	B6-02-5002-04-0	Center Section Lid Assembly, *See Section 7.6*
7	1	B6-02-5003-69-0	OrbSorb® Reduced Mass Scrubber[3]
8	1	B6-02-5002-07-1	Center Section Assembly, *See Section 7.7*
9	1	---	Pneumatics Assembly, *See Section 7.9*
10	1	B6-01-5000-05-0	Alarm Monitor, *See Section 7.11*
11a	1	B6-02-5001-98-0	Green Oxygen Cylinder, *See Section 7.12*
11b	1	B6-02-5002-06-0	Black/White Oxygen Cylinder, *See Section 7.12*
12	1	B6-02-5002-29-0	Lower Housing Assembly, *See Section 7.13*
13	1	B2-02-7001-24-0	Harness Assembly-Flame Rated
14	2	B6-02-5002-40-0	Ice Canister Freeze Form, *See Section 7.14*
15	1	B5-06-6000-22-0	User Manual-ENGLISH[4]
16	1	B5-06-6000-23-0	Benchman Manual-ENGLISH[4]
17	1	B2-02-7001-07-0	Moisture Control Set
18	1	B6-02-5003-34-0	Scrubber Moisture Pad[5]
19	1	B6-02-5002-41-0	Phase Change Heat Exchanger (PCM)
20a	1	B2-02-4001-50-0	PRO PP Storage Plug
20b	1	B2-02-4000-90-0	AV3000 Storage Plug
21a	1	B6-02-5002-54-0	Cylinder Fill Adapter, CGA 540 Male[6]
21b	1	B6-02-5002-55-0	Cylinder Fill Adapter, CGA 540 Female[6]
21c	1	B6-02-5002-53-0	Cylinder Fill Adapter, G ¾-A Male[6]
21d	1	B6-02-5002-66-0	Cylinder Fill Adapter, W21.8 Male[6]
22	opt.	B6-02-5002-63-0	Hard Transit Case (not depicted)
23	opt.	B2-02-7000-39-0	Soft Transit Case (not depicted)

Note:

1. The BioPak 240R respirator is supplied in a cardboard/foam shipping box. Reference the below listed key for BioPak configuration:

Code	Description
EN	EN145 Certified
FR	Flame Rated Harness
G	Green Oxygen Cylinder
BW	Black/White Oxygen Cylinder
b	bar Pressure Gauge Units
p	psi Pressure Gauge Units
MPa	Mega Pascal Pressure Gauge Units
PRO	Configured for PRO PP Facemask
AV	Configured for AV3000 Facemask

2. Facemasks are to be ordered separately.
3. OrbSorb® Scrubber is supplied in case form. Each case will supply four sets of scrubber canisters, four sets of scrubber moisture pads and four set of Turn Around Maintenance Tags.
4. Manuals are provided standard in English language. Other languages can be supplied by contacting Biomarine.
5. Scrubber Moisture Pads are supplied with the CO2 Scrubber case but can be purchased separately.
6. Cylinder Fill Adapters are required to connect the oxygen cylinder to a booster pump. The customer will only need as many adapters as there ports available on the booster pump. Reference below for detail on adapter types.

Item 21a, Cylinder Fill Adapter, CGA-540 Male
B6-02-5002-54-0

This connector will adapt a CGA-540 female connection to the BioPak 240R cylinder.

Item 21b, Cylinder Fill Adapter, CGA-540 Female
B6-02-5002-55-0

This connector will adapt a ¼ NPT female port to a CGA-540 female connection.

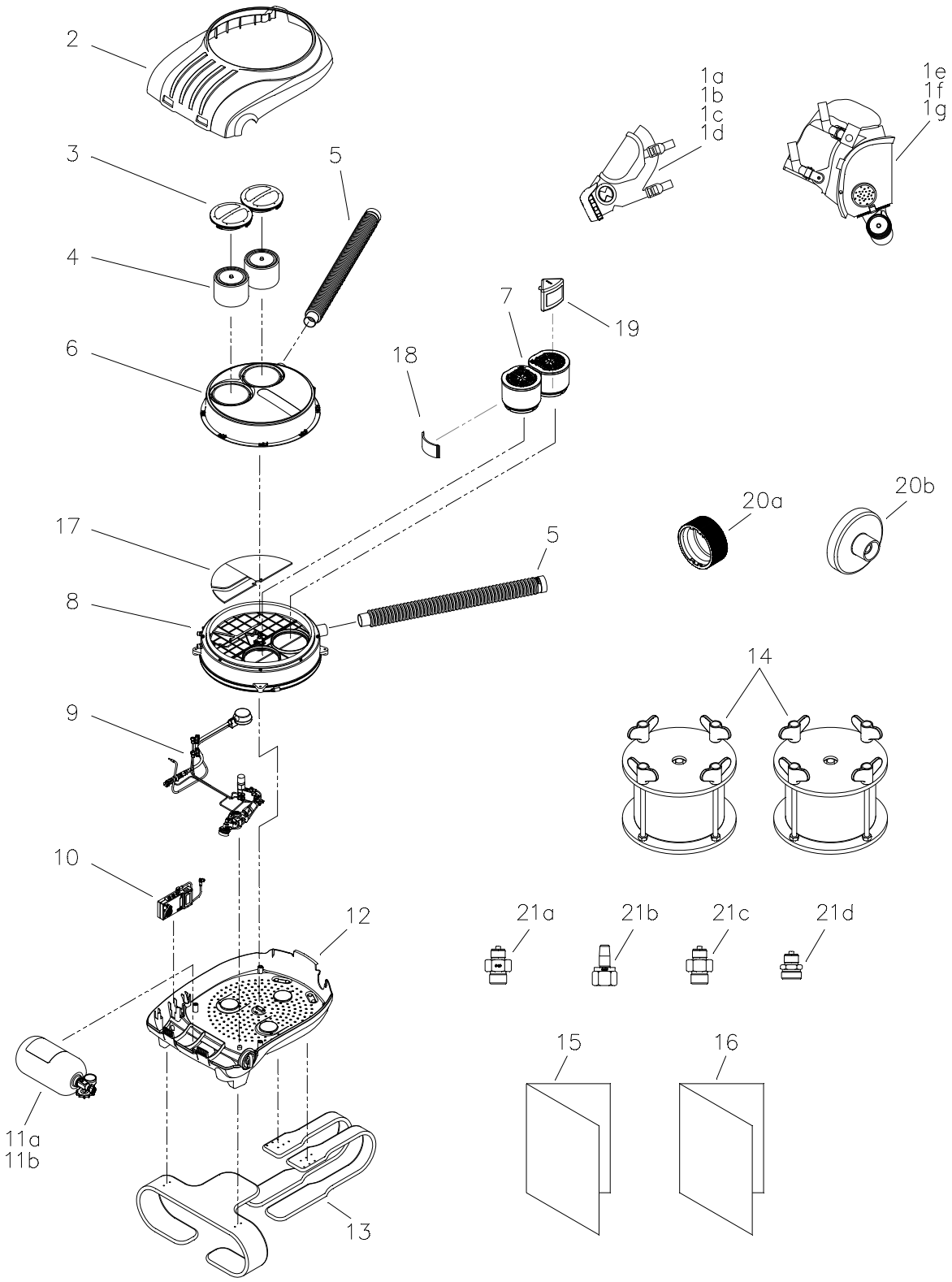
The above picture shows the CGA-540 Male and Female adapters connected together. This arrangement will provide adaptation from a ¼ NPT female port to the BioPak 240R cylinder.

Item 21c, Cylinder Fill Adapter, G ¾-A Male
B6-02-5002-53-0

This adapter will provide direct adaptation from a female G ¾-A connection (commonly found on European booster pumps) to the BioPak 240R cylinder.

Item 21d, Cylinder Fill Adapter, Drager Booster
B6-02-5002-66-0

This adapter will provide direct adaptation from a female W21.8 connection (commonly found on Drager booster pumps) to the BioPak 240R cylinder.

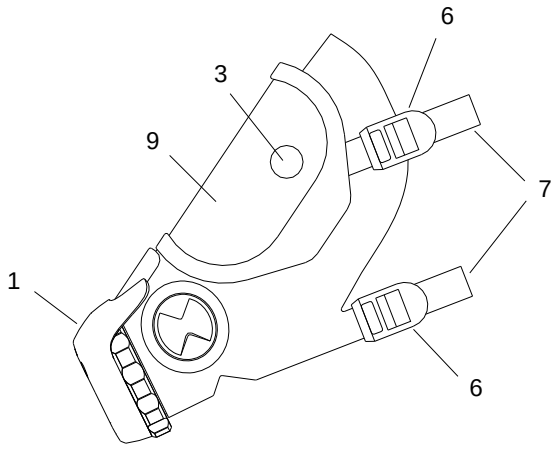

2
3
5
4
1a
1b
1c
1d
1e
1f
1g
7
19
6
18
17
5
20a
20b
8
14
9
10
12
21a
21b
21c
21d
15
16
11a
11b
13

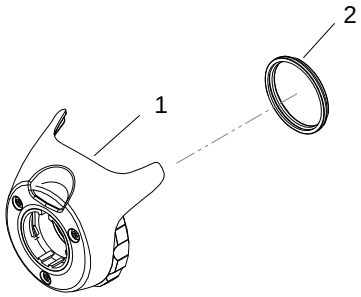
7.2 PRO PP Facemask Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5003-09-1	PRO Facemask, Small[1, 3]
REF	-	B6-02-5003-21-1	PRO Facemask, Small with Drink Tube[1, 3]
REF	-	B6-02-5003-09-0	PRO Facemask, Medium[1, 3]
REF	-	B6-02-5003-21-1	PRO Facemask, Medium with Drink Tube[1, 3]
1	1	B6-02-5002-99-0	Interface Adapter-Complete
2	1	B2-02-7100-22-0	Seal Ring[2]
3	1	B2-06-6002-31-0	Magnetic Lens Wiper
4	1	B2-06-6001-70-0	Tote Bag (not depicted)
5	1	B2-06-6002-46-0	Replacement Drink Tube (not depicted)
6	1	B2-06-6002-50-0	Buckle/Roller Kit, Package of 5
7	1	B2-06-6002-51-0	Head Harness
8	1	B2-06-6002-52-0	Neck Strap (not depicted)
9	1	B6-02-5003-47-0	Replacement Lens with Anti-Fog Film[3]
10	-	B2-06-6002-37-0	Optional Spectacle Kit (not depicted)
11	-	B6-02-5003-43-0	Optional Field Test Kit (not depicted)
12	-	B5-06-6900-13-0	Optional Field Service Manual (not depicted)

Note:

1. The complete Facemask Assembly includes the facemask itself plus the complete Adapter.
2. Coat the Seal Ring with Dow 111 lubricant before use.
3. The mask is supplied from the factory with a permanent anti-fog film applied to the internal surface of the lens. This film **can not** be applied to the mask in the field due to required conditions for installation.



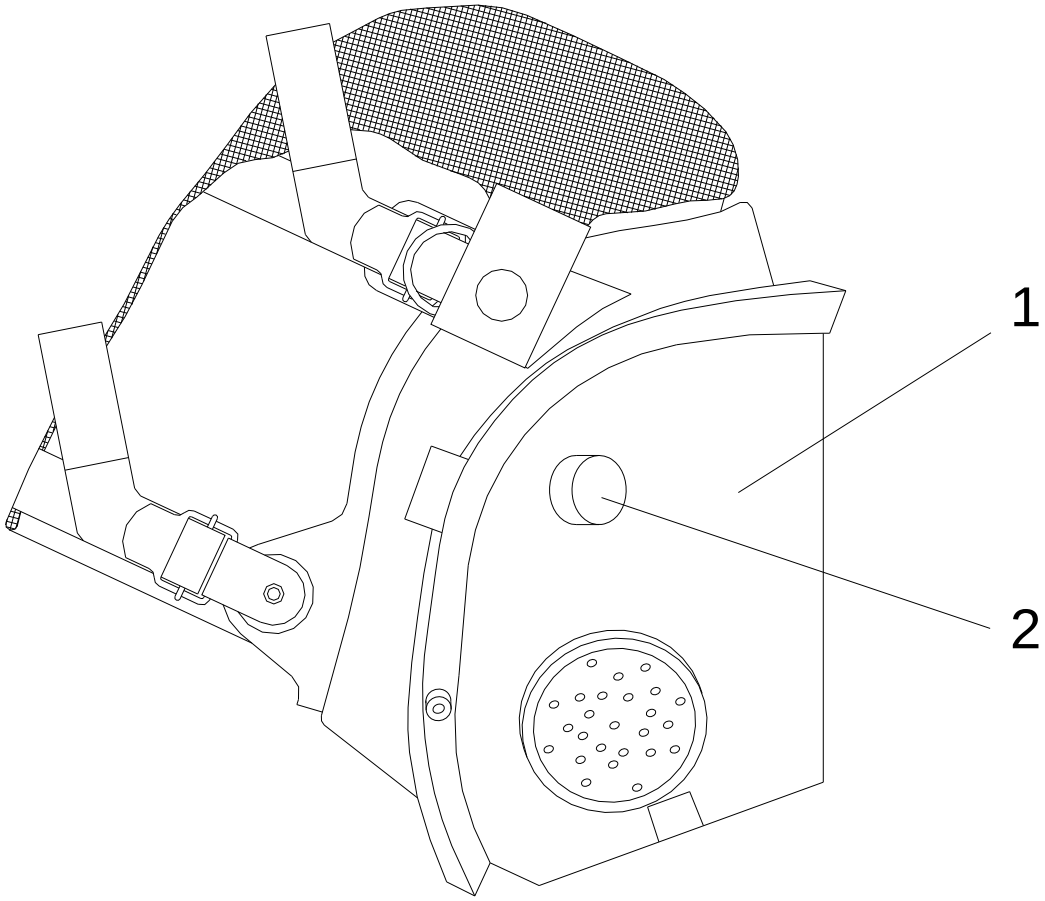


7.3 AV3000 Facemask

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5002-09-3	AV3000 Complete Facemask-Small
REF	-	B6-02-5002-09-4	AV3000 Complete Facemask-Medium
REF	-	B6-02-5002-09-5	AV3000 Complete Facemask-Large
1	1	B6-02-5003-41-0	Replacement Front Lens with Anti-Fog Film
2	1	B2-06-6002-31-0	Magnetic Lens Wiper
3	-	B2-06-6001-64-0	Optional Kevlar Neck Strap (not depicted)
4	1	B2-06-6001-70-0	Facemask Storage Bag (not depicted)
5	-	B6-02-5002-42-0	Optional Spectacle Kit
6	-	B6-02-5003-44-0	Optional Field Test Kit

Note:

1. The Complete Breathing Hose Set includes all depicted items.
2. The Mask Adapter Assembly includes the check valves, item 6, and o-ring, item 5.
3. Lubricate the O-Ring with Dow 111 prior to use.
4. DO NOT lubricate the check valves.

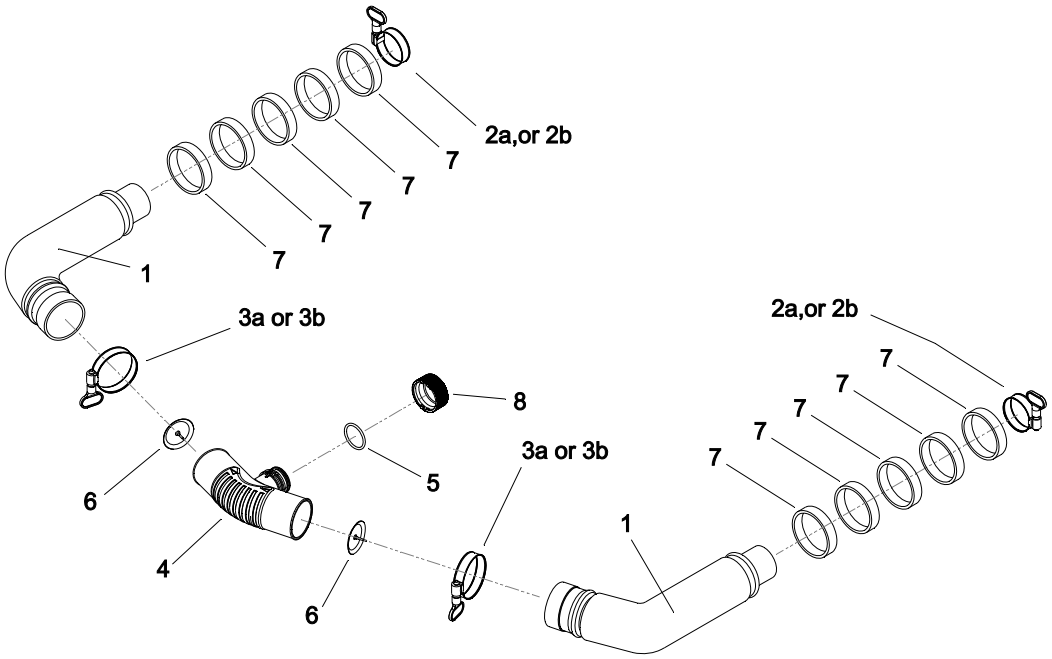


7.4 PRO Breathing Hose

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	--	B6-02-5003-03-0	PRO Breathing Hose Set, Turn Key Clamps[1]
REF	--	B6-02-5003-03-1	PRO Breathing Hose Set, Non-Turn Key Clamps[1]
1	2	B2-02-7001-09-0	Breathing Hose
2a	2	B2-06-6002-19-0	Turn Key Clamp (requires no tool to operate)
2b	2	B2-06-6000-01-0	Worm Gear Clamp (requires tool to operate)
3a	2	B2-06-6002-30-0	Turn Key Clamp (requires no tool to operate)
3b	2	B2-06-6001-60-0	Stepless Ear Clamp (requires tool to operate)
4	1	B6-02-5003-01-0	PRO Mask Adapter Assembly[2]
5	1	B4-04-7060-25-0	Mask Adapter O-Ring[3]
6	2	B2-02-7001-11-0	Check Valves[4]
7	10	B2-02-4101-22-0	Anti-Crush Ring
8	1	B2-02-4001-50-0	Storage Plug
9	-	B2-03-1000-11-0	Optional Stepless Ear Clamp Ratchet Tool[5]

Note:

1. The Complete Breathing Hose Set includes all depicted items.
2. The Mask Adapter Assembly includes the check valves, item 6, and o-ring, item 5.
3. Lubricate the O-Ring with Dow 111 prior to use.
4. DO NOT lubricate the check valves.
5. Ratchet tool is required to close stepless ear clamp and is not provided in the standard service kit. Stepless ear clamps are one-time use only.

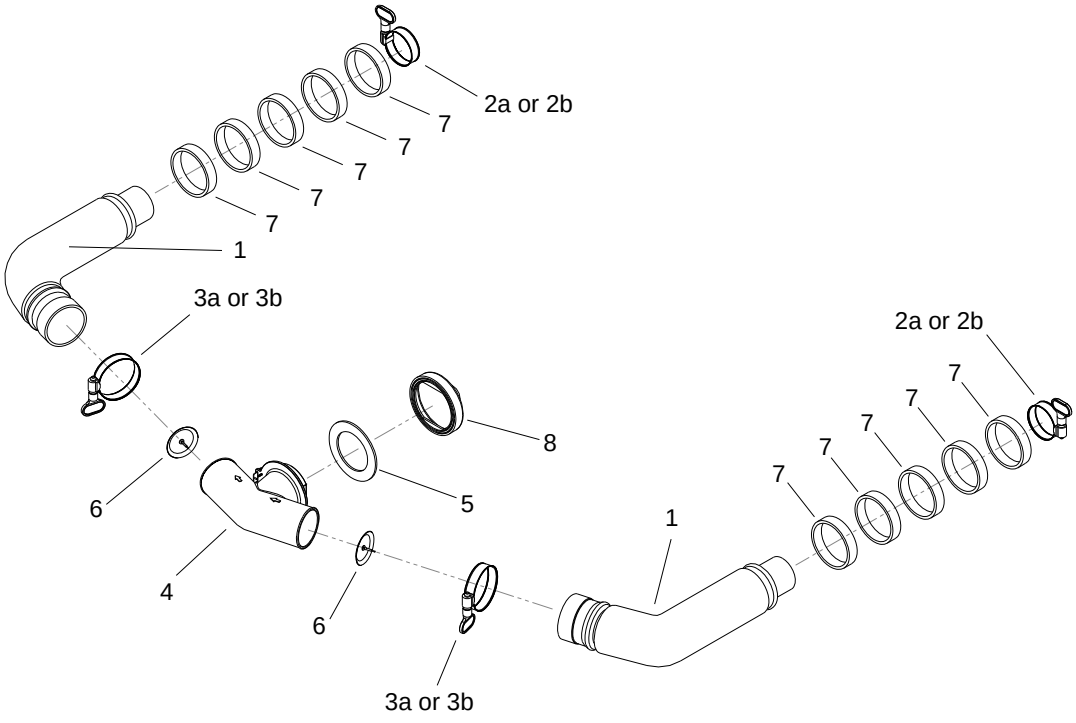


7.5 AV3000 Breathing Hose Set

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5002-73-0	AV3000 Hose Set-Complete[1]
1	2	B2-02-7001-09-0	Breathing Hose
2a	2	B2-06-6002-19-0	Turn Key Hose Clamp
2b	2t	B2-06-6000-01-0	Worm Gear Hose Clamp
3a	2	B2-06-6001-60-0	Stepless Ear Clamp
3b	2	B2-06-6002-30-0	Turn Key Hose Clamp
4	1	B6-02-5002-25-0	AV3000 Adapter Assembly
5	1	B2-06-6001-34-0	Facemask Adapter Gasket
6	2	B2-02-7001-11-0	Check Valve[2]
7	10	B2-02-4101-22-0	Anti-Crush Ring
8	1	B2-02-4000-90-0	AV3000 Storage Plug
9	-	B2-03-1000-11-0	Optional Stepless Ear Clamp Ratchet Tool[3]

Note:

1. Hose Set includes (2) breathing hoses factory attached to AV3000 facemask adapter, (1) gasket, (10) anti-crush rings, (2) stepless ear clamps and (2) worm hose clamps. Facemask adapter will contain check valves, retaining clip and gasket.
2. Contact Biomarine for proper installation procedure of Check Valves, item 6.
3. Ratchet tool is required to close stepless ear clamp and is not provided in the standard service kit. Stepless ear clamps are one-time use only.

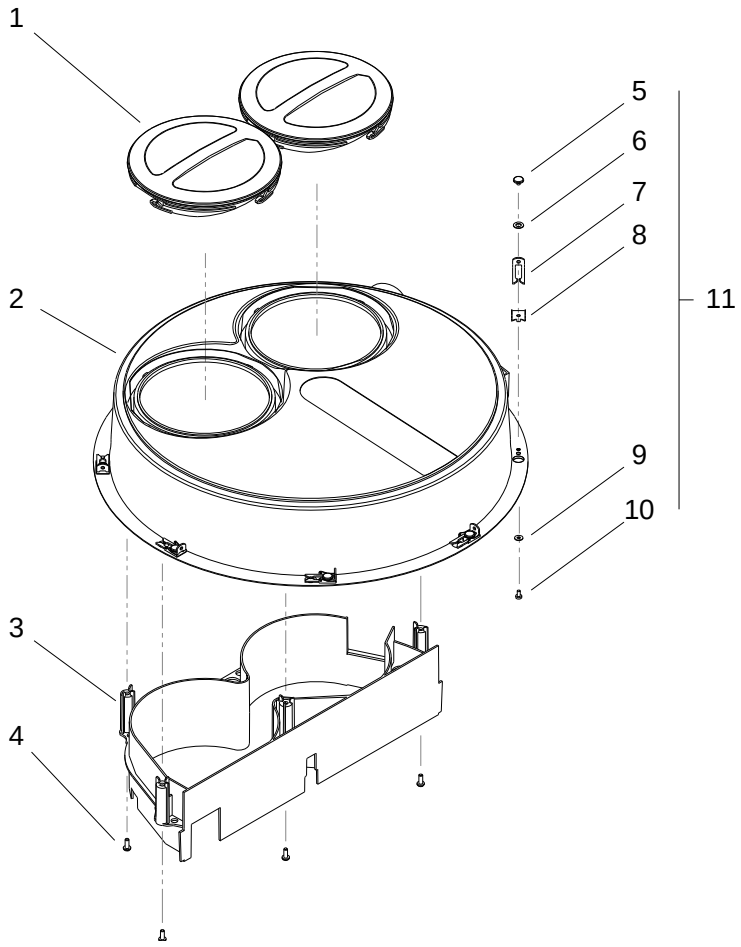


7.6 Center Section Lid Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-04-3	Center Section Lid Assembly-Complete
1	2	B2-02-4000-39-0	Coolant Lid
2	1	B6-02-5002-04-4	Center Section Lid[1]
3	1	B2-02-4000-72-1	Flow Baffle
4	4	B3-01-3064-00-1	#6 x 1/2" Self-Tapping Screws
5	8	B2-02-3100-17-0	Slide Fastener
6	8	B2-06-6000-06-0	Slide Top Washer
7	8	B2-06-6000-04-0	Slide Mechanism
8	8	B2-06-6000-05-0	Slide Guide Plate
9	8	B3-03-1023-01-0	Slide Bottom Washer
10	8	B3-01-1022-01-0	Slide Fastening Screw
11	8	B6-02-5002-92-0	Slide Kit[2]

Note:

1. Center Section Lid, item 2, is supplied with slide mechanisms installed, coolant shells installed, center section washers and instruction manual for installation. The baffle and coolant lids are not supplied.
2. Slide Kit, item 11, will supply one each of items 5 through 10.

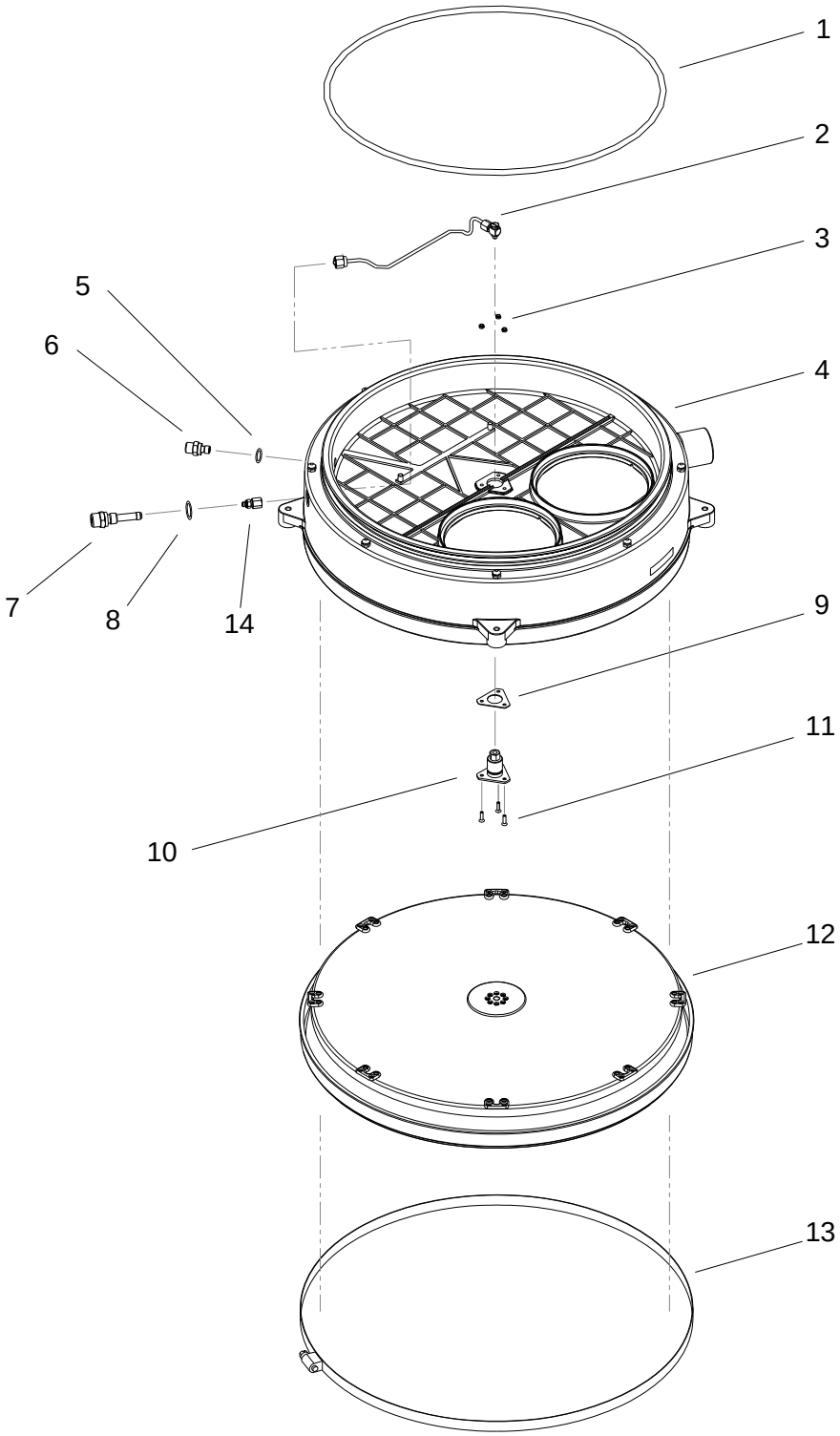


7.7 Center Section Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-07-5	Center Section Assembly-Complete
1	1	B4-04-7060-20-0	Lid O-Ring[1]
2	1	B6-02-5002-24-0	Demand Feed Tube
3	3	B3-02-0040-00-0	#4-40 Locking Hex Nut
4	1	B6-02-5002-07-6	Center Section Body Assembly[5]
5	1	B4-04-7070-03-1	Constant Add Fitting O-Ring[2]
6	1	B2-02-3300-06-0	Constant Add Fitting[3]
7	1	B2-02-3300-48-0	Demand Add Fitting[3]
8	1	B4-04-7060-01-1	Demand Add Fitting O-Ring[2]
9	1	B2-02-7001-10-0	Demand Valve Gasket[4]
10	1	B6-02-5002-23-0	Demand Valve Assembly
11	3	B3-01-0043-00-0	#4 x 3/8” Sealed Flat Head Screw[4]
12	1	B6-02-5002-05-0	Diaphragm Assembly, *See Section 7.8*
13	1	B2-06-6001-47-0	Diaphragm Clamp
14	1	B4-03-5204-08-0	#10 x 1/8” Tube Male Connector Fitting

Note:

1. Indicated components require lubrication with Dow-111 O-Ring Lubricant, B5-01-3000-11-0 prior to installation.
2. Indicated components require lubrication with Christo-Lube O-Ring Lubricant, B5-01-3000-01-0 prior to installation.
3. Install indicated components to a torque of 25-30 in-lbs.
4. Indicated components shall be installed with no lubricant.
5. Center Section Body Assembly, item 4, includes all depicted components with the exception of diaphragm, item 12, and diaphragm clamp, item 13.

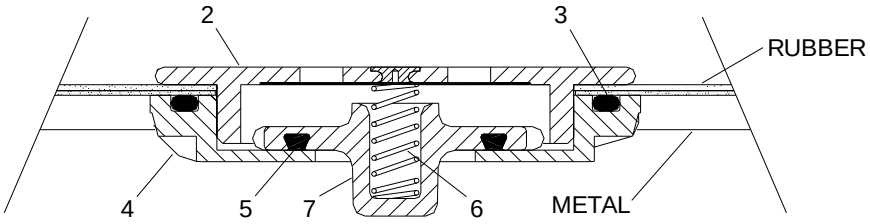

1
2
3
4
5
6
7
8
14
9
11
10
12
13

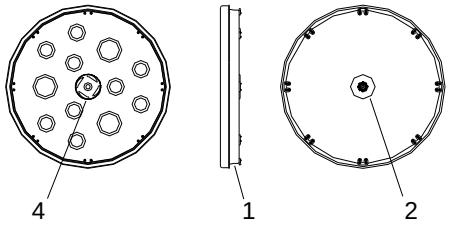
7.8 Diaphragm Assembly

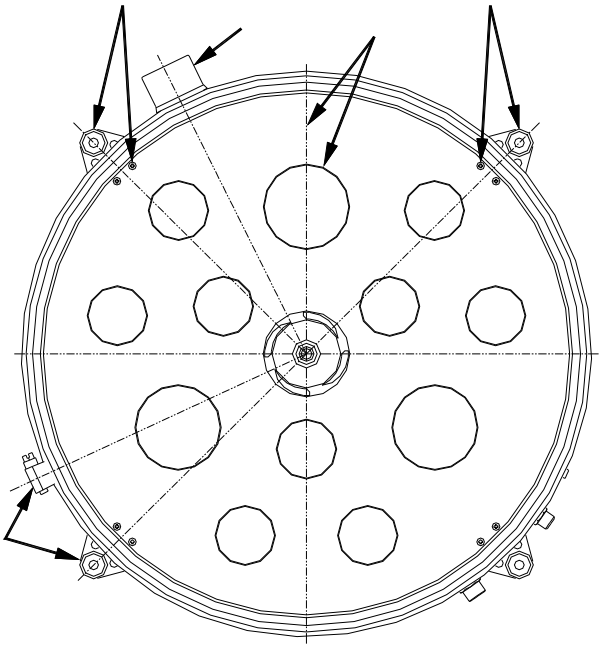
ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-05-0	Diaphragm Assembly-Complete
1	1	B6-02-5002-19-0	Flexible Diaphragm
2	1	B2-02-0000-08-0	Vent Cap
3	1	B4-04-7060-05-1	Vent Body O-Ring[1]
4	1	B2-02-4100-03-0	Vent Body[2]
5	1	B4-04-7060-04-1	Vent Seat O-Ring[1]
6	1	B2-06-6001-53-0	Vent Valve Spring
7	1	B2-02-4000-89-1	Vent Valve Seat

Note:

1. Indicated components shall be lubricated with Dow-111 O-Ring Lubricant, B5-01-3000-11-0, prior to installation.
2. Install Vent Body, item 4, hand tight.





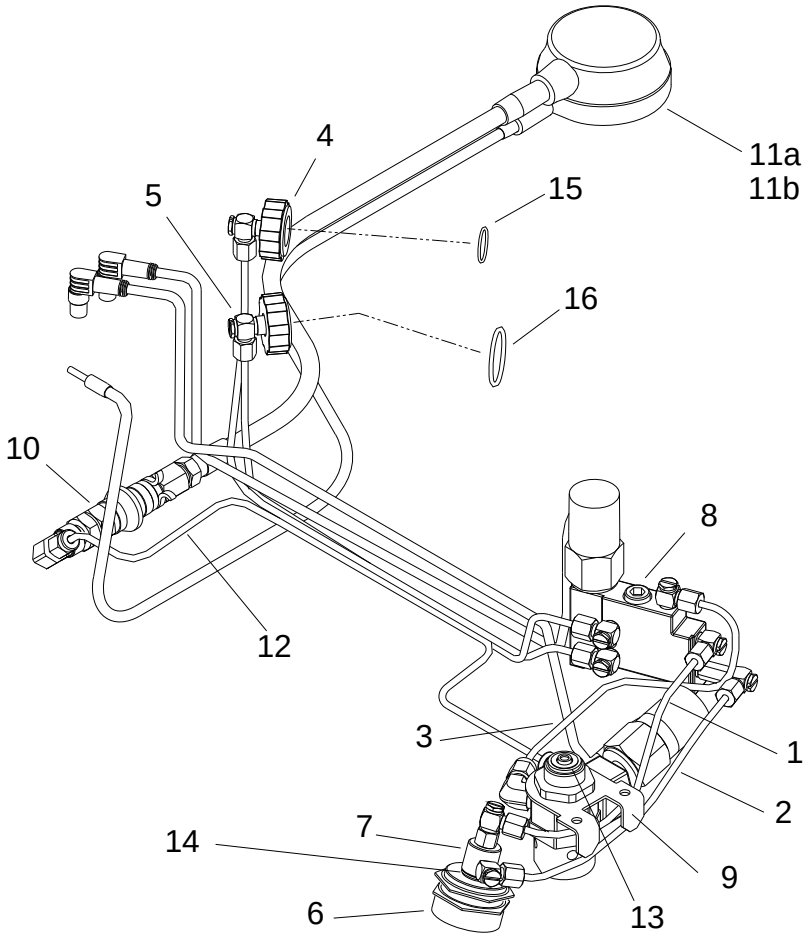


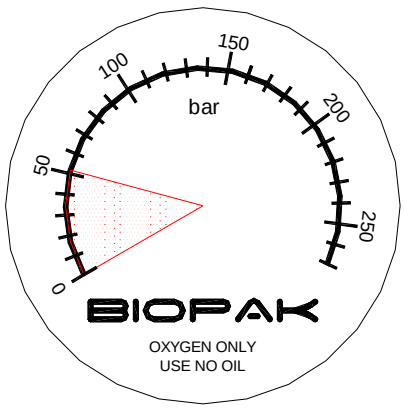
7.9 Pneumatic Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	---	Pneumatic Assembly
1	1	B6-02-5002-31-0	Bypass Feed Tube
2	1	B6-02-5002-32-0	Bypass Return Tube
3	1	B6-02-5002-30-0	Oxygen Feed Tube
4	1	B6-02-5002-03-1	Constant Add Center Section Feed Tube
5	1	B6-02-5002-02-1	Demand Add Center Section Feed Tube
6	1	B4-04-5000-00-0	Bypass Valve Push Button
7	1	B4-04-5570-00-0	Bypass Valve
8	1	B6-02-5002-00-1	Manifold Assembly, *See Section 7.10*
9	1	B6-02-5002-26-1	Oxygen Regulator Assembly[1]
10	1	B6-02-5002-43-0	Remote Gauge Shut Off Valve Assembly
11a	1	B6-02-5002-45-4	Remote Gauge Assembly-bar
11b	1	B6-02-5002-45-0	Remote Gauge Assembly-psi/bar
12	1	B6-02-5002-44-0	Remote Gauge Feed Tube Assembly
13	1	B4-04-0030-00-0	Cylinder Seal Washer
14	1	B2-02-3300-14-0	Bypass Valve Spring[2]
15	1	B4-04-7070-02-1	Constant Add Tube O-Ring[3]
16	1	B4-04-7070-00-1	Demand Add Tube O-Ring[3]

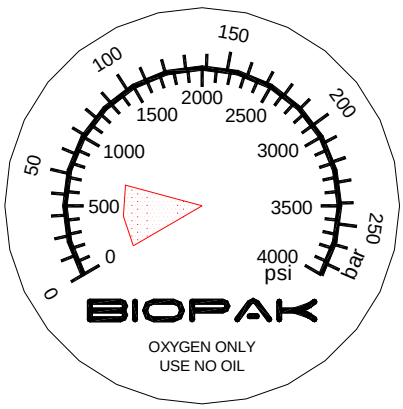
Note:

1. Oxygen Regulator, Item 9, is supplied as a complete assembly only. Regulator will mount to BioPak lower housing with two #8 x 3/8" Self-Tapping Screws, B3-01-4071-00-0
2. Bypass valve spring, item 14, is to install between the bypass valve and the bypass valve push button. Spring shall seat around the actuator stem of the bypass valve.
3. Indicated components require lubrication with Christo-Lube O-Ring Lubricant, B5-01-3000-01-0, prior to installation.





bar Gauge Dial Face
Item 11a



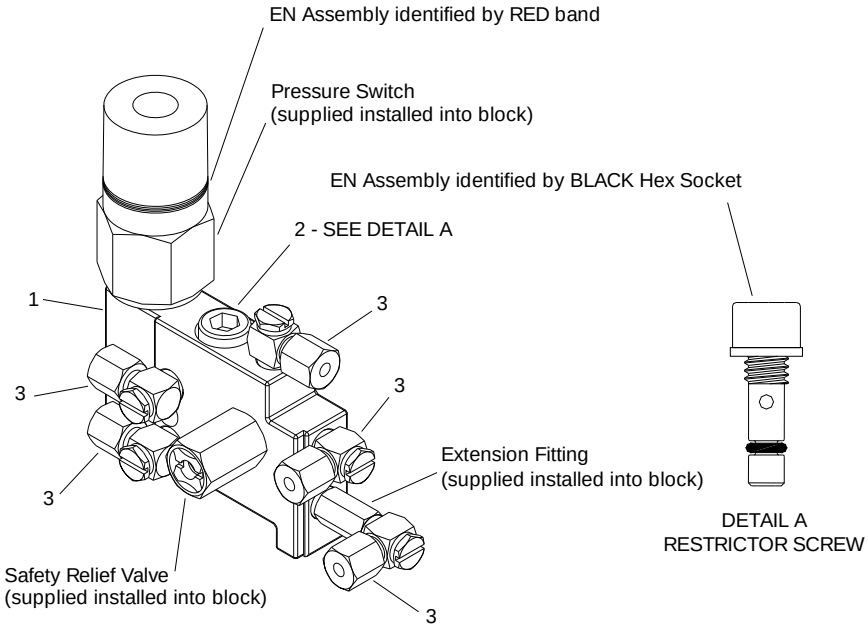
psi/bar Gauge Dial Face
Item 11b

7.10 Manifold Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	1	B6-02-5002-00-1	Manifold Assembly-Complete[2]
1	1	B6-02-5002-21-1	Manifold Block w/ Pressure Switch & Fittings
2	1	B6-02-5002-50-1	Flow Restrictor Assembly-Complete
3	5	B4-03-5203-01-0	Swivel Elbow Fitting[1]

Note:

1. Fittings, Item 5, are supplied on spare tube assemblies.
2. Manifold assembly mounts to lower housing of BioPak using two each of #6 x 3/8” screws, B3-01-1061-01-1, and tooth washers, B3-03-3063-00-0.



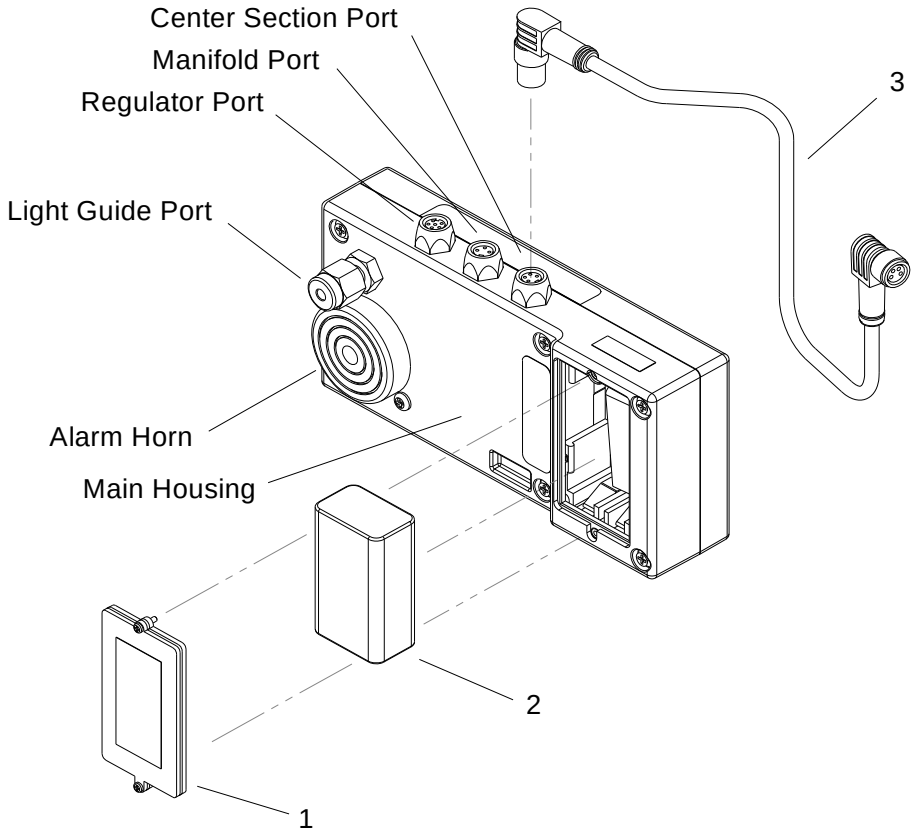
7.11 Alarm Monitor

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-01-5000-05-0	Alarm Monitor-Complete
1	1	B6-02-5002-51-0	Replacement Battery Door
2	1	B1-14-2000-00-0	9VDC Battery[1]
3	1	B1-10-3000-03-0	Center Section Cable

Note:

1. Only the below listed battery types are suitable for use in the Monitoring System. Use of any other battery type will void intrinsic safety rating and certification.

   Energizer #522
   Panasonic #6AM6
   Rayovac #A1604
   Duracell #MN1604

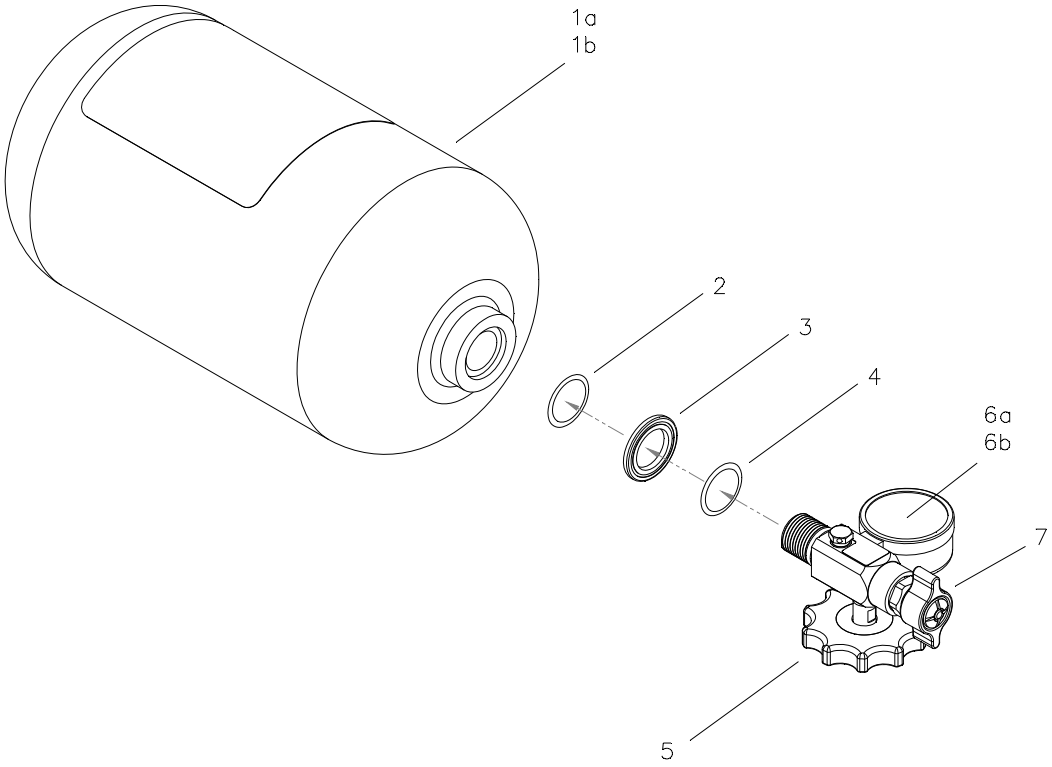


7.12 Oxygen Cylinder Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	-	B6-02-5002-06-0	Black/White Cylinder Assembly-Empty
REF	-	B6-02-5001-98-0	Green Cylinder Assembly-Empty
1a	1	B2-01-2000-06-1	Black/White Cylinder
1b	1	B2-01-2000-06-0	Green Cylinder
2	1	B4-04-7060-00-0	Exterior O-Ring[1]
3	1	B2-02-3300-52-1	Valve Collar[2]
4	1	B4-04-7060-07-2	Interior O-Ring[1]
5	1	B6-02-5001-97-0	Valve Assembly[2]
6a	1	B2-06-6001-38-0	Replacement Gauge Lens-WIKA Gauge Type[3]
6b	1	B2-06-6001-40-0	Replacement Gauge Lens-AMETEK Gauge Type[3]
7	1	B2-02-4000-64-0	Replacement Cylinder Valve Knob

Note:

1. Indicated O-Rings, require lubrication with Christo-Lube Lubricant, B5-01-3000-01-0, prior to installation.
2. Valve Assembly, Item 5, includes valve plus components numbered Item 2 through Item 4. The Valve Assembly shall be installed into the cylinder at a torque of 60 +/- 1 foot-pound.
3. Determine gauge manufacturer as WIKA or AMETEK before ordering replacement lens, item 6a or 6b.

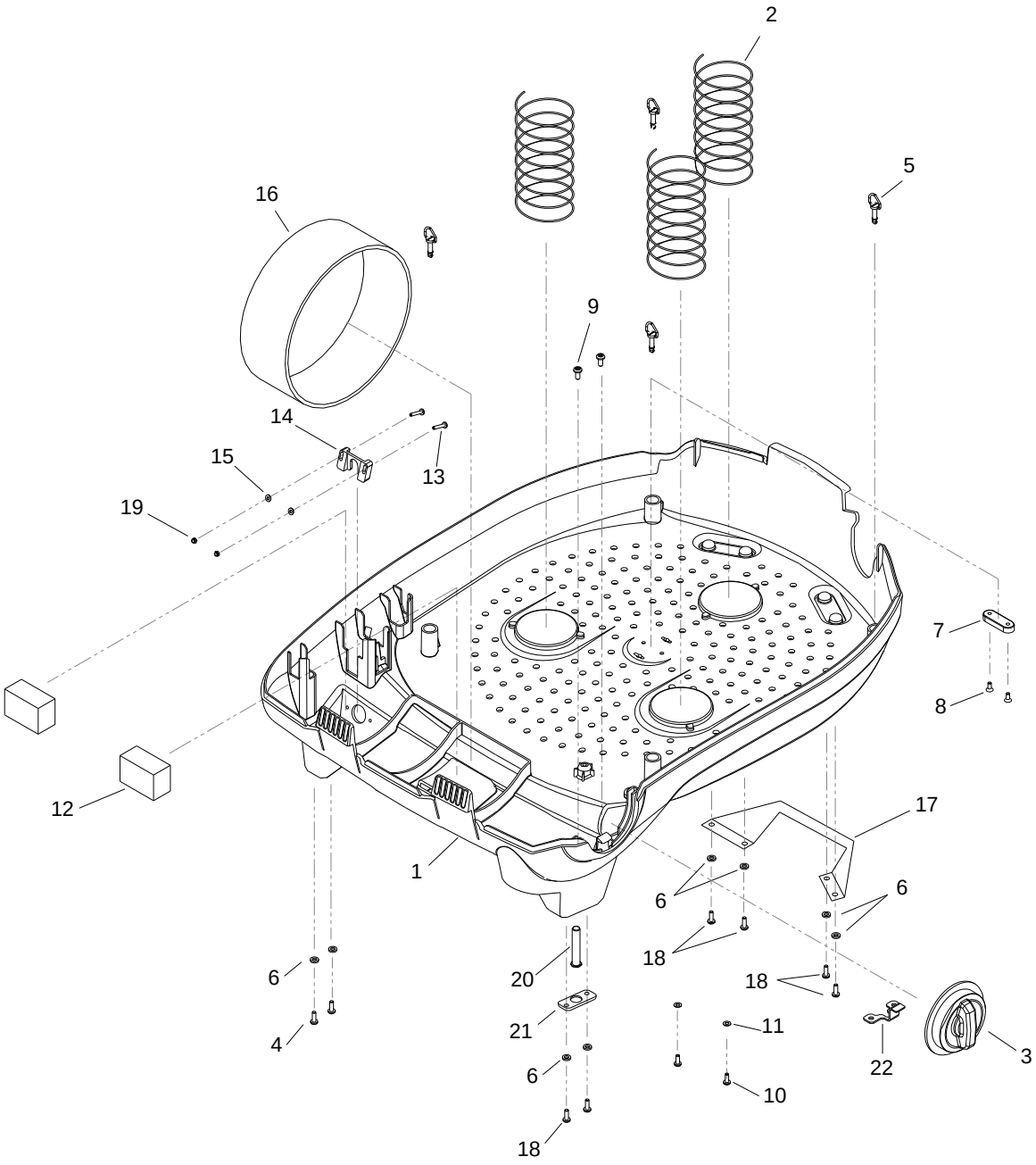


7.13 Lower Housing Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
1	1	B6-02-5002-29-0	Lower Housing Shell
2	3	B2-02-3300-46-1	Diaphragm Springs[1]
3	1	B2-02-4000-68-0	External Oxygen Knob[2]
4	2	B3-01-1071-03-0	Harness Waist Belt Fastening Screws[3]
5	4	B3-01-0008-00-0	¼-Turn Center Section Hold Down Pins
6	8	B3-03-1073-00-0	Harness Mounting Washers[3]
7	1	B2-02-1300-27-0	Vent Spacer
8	2	B3-01-1063-00-0	Vent Spacer Mounting Screw[3]
9	2	B3-01-4011-00-0	Oxygen Regulator Mounting Screw
10	2	3-01-1061-01-1	Manifold Mounting Screw[3]
11	2	B3-03-3063-00-0	Manifold Mounting Washer[3]
12	2	B2-02-7001-30-0	Latch Foam Pad
13	2	B3-01-1042-00-0	Remote Gauge Mounting Screw[3]
14	1	B2-02-1100-10-0	Remote Gauge Mounting Bracket
15	2	B3-03-3043-00-0	Remote Gauge Tooth Washer
14	1	B3-01-1071-04-0	Remote Gauge Mounting Screw[3]
15	1	B3-02-4070-01-0	Remote Gauge Mounting Nut
16	1	B2-02-7001-21-0	Oxygen Cylinder Hold-Down Strap[4]
17	1	B2-02-4001-29-1	Kevlar Carrying Handle[3]
18	6	B3-01-1071-01-0	Handle/Harness Shoulder Strap Mounting Screw[3]
19	2	B3-02-4040-00-0	Remote Gauge Hex Nut
20	1	B2-02-1300-29-0	Regulator Support Tube
21	1	B2-02-1300-05-0	Regulator Support Plate
22	1	B2-02-1100-11-0	Oxygen Knob Retaining Bracket

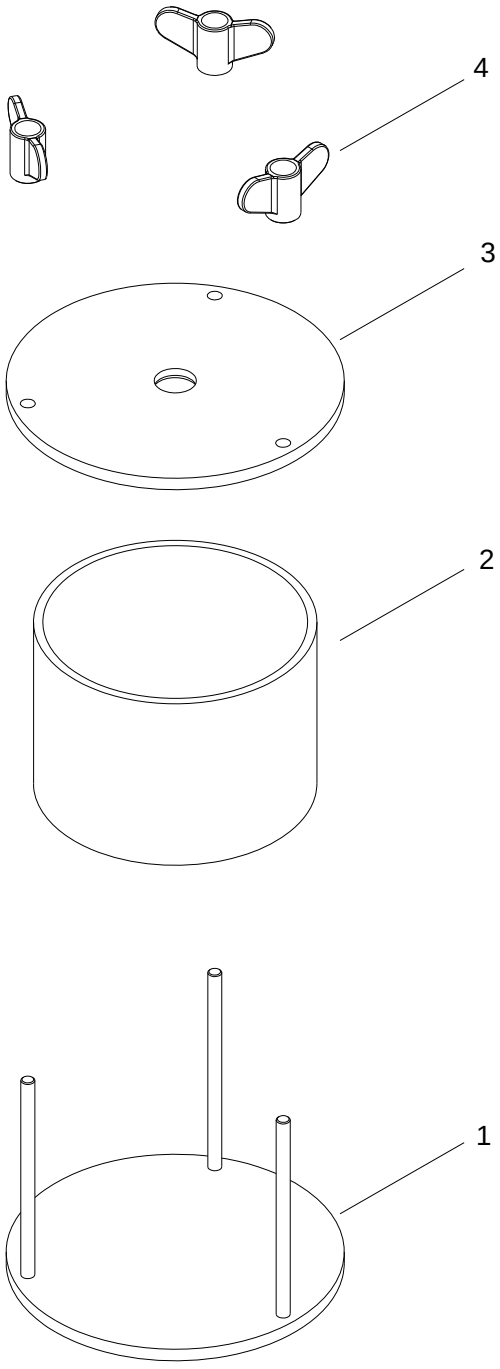
Note:

1. Diaphragm Springs, Item 2, install into lower housing by threading onto spring retainer projections.
2. External Oxygen Knob, Item 3, snaps into position within lower housing.
3. Indicated components are to be installed from the external side of the lower housing shell.
4. Oxygen Bottle Strap, item 16, is to be threaded through the lower housing shell slots for installation.


2
5
16
9
14
15
13
19
7
8
12
1
17
6
6
18
6
18
20
18
6
4
21
11
6
10
22
3
18

7.14 Ice Canister Freeze Form

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	--	B6-02-5002-40-0	Ice Canister Freeze Form-Complete
1	1	B6-02-5002-58-0	Base Assembly
2	1	B2-02-4001-46-0	Freeze Tube
3	1	B2-02-1100-06-0	Top Plate
4	3	B3-02-4100-00-0	Wing Nut

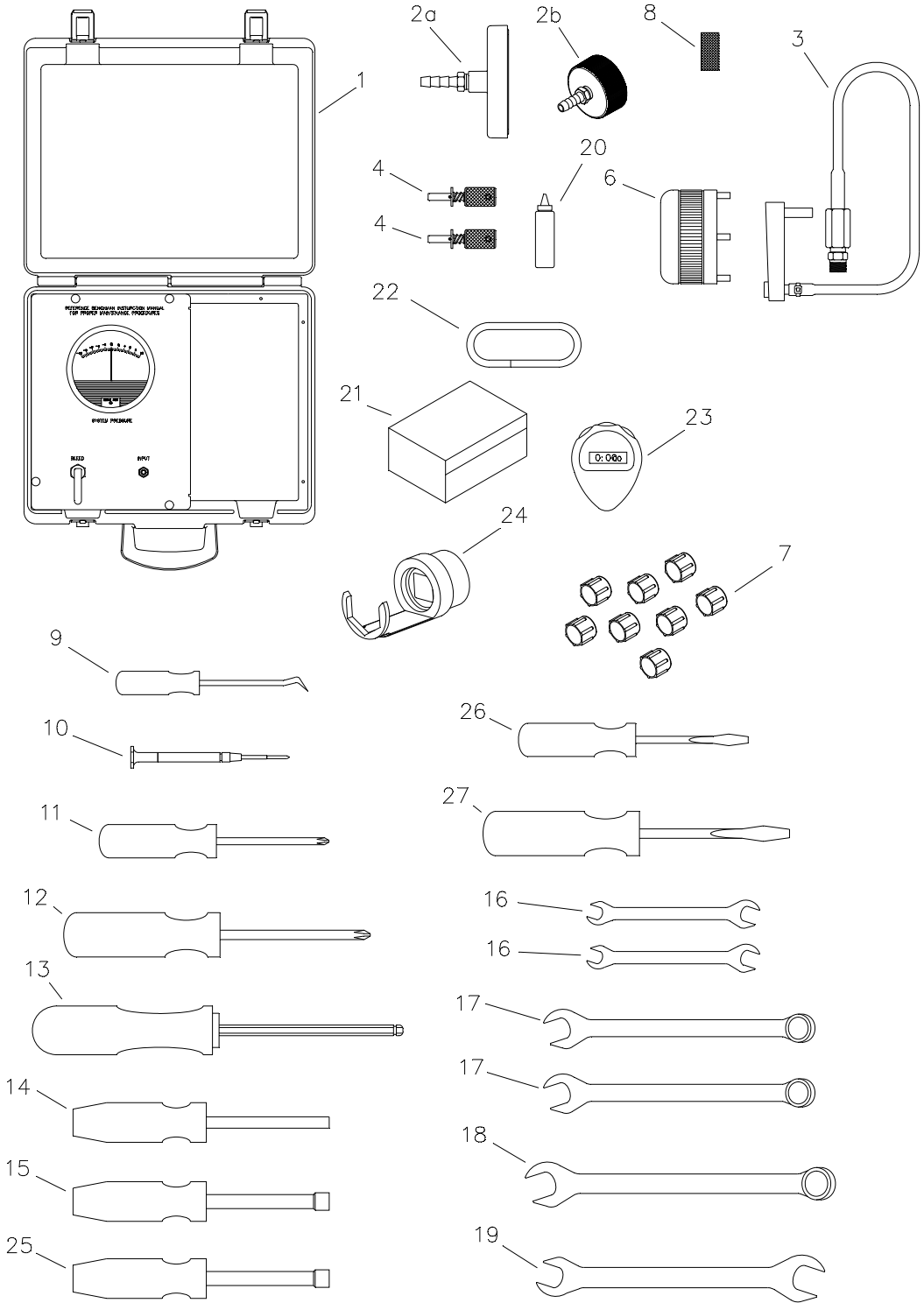


7.15 Service Kit Assembly

ITEM #	QTY.	PART NUMBER	DESCRIPTION
REF	--	B6-02-5002-16-0	Tool/Test Kit-Complete-“WC
REF	--	B6-02-5002-16-3	Tool/Test Kit-Complete-milli-bar
1a	1	B6-02-5002-57-0	Replacement Case Assembly-“WC[1]
1b	1	B6-02-5002-57-1	Replacement Case Assembly-milli- bar[1]
2a	1	B6-02-5002-15-0	AV3000 Flow Test Fixture
2b	1	B6-02-5003-00-0	PRO Flow Test Fixture
3	1	B6-02-5002-15-0	Flow Test Fixture
4	2	B6-02-5000-17-2	Test Key
6	1	B2-03-3000-01-0	Vent Valve Hand Wrench
7	8	B2-06-6002-60-0	Demand Port Wash Plug
8	1	B2-02-5400-04-0	Regulator Wash Plug
9	1	B2-03-1000-10-0	Combination Pick Tool
10	1	B2-03-1000-15-0	#00 Phillips Screwdriver
11	1	B2-03-1000-03-0	#1 Phillips Screwdriver
12	1	B2-03-1000-16-0	#2 Phillips Screwdriver
13	1	B2-03-1000-17-0	¼” Hex Driver
14	1	B2-03-1000-09-0	3/16” Nut Driver
15	1	B2-03-1000-12-0	5/16” Nut Driver
16	2	B2-03-1000-04-0	3/8” x 5/16” Open End Wrench
17	2	B2-03-1000-06-0	7/16” Combination Wrench
18	1	B2-03-1000-13-0	½” Combination Wrench
19	1	B2-03-1000-05-0	5/8” x 9/16” Open End Wrench
20	1	B5-01-3000-03-0	Oxygen Safe Leak Detection Fluid, 8 ounces
21	1	B2-02-7001-28-0	Tool Pouch
22	1	B4-02-6037-00-0	Rubber Tubing[2]
23	1	B2-03-1000-20-0	Stop Watch
24	opt.	B2-03-3000-08-0	Bypass Valve Tool[3]
25	1	B2-03-1000-21-0	9/32 Nut Driver

Note:

1. Replacement Case Assembly, item 1, includes the tool kit case complete with internal pressure gauge and associated plumbing plus external shipping box.
2. Order a minimum length of 6-feet of tubing. Longer lengths are available upon request.
3. The Bypass Valve Tool, item 24, is not supplied with the Tool Kit. The tool is utilized for installation and removal of the entire bypass valve assembly.


1
2a
2b
8
3
4
4
20
6
22
21
23
24
7
9
10
26
11
27
12
16
16
13
17
17
14
18
15
19
25

7.16 Miscellaneous Supplies

DESCRIPTION	PART NUMBER
Seal Kit (includes all replacement seals & lubricants)	B6-02-5002-14-0
Seal Kit (includes all replacement seals without lubricants)	B6-02-5002-14-1
Christo-Lube O-Ring Lubricant (2-ounce tube)	B5-01-3000-01-0
Dow-111 O-Ring Lubricant (5.3-ounce tube)	B5-01-3000-11-0
Oxygen Safe Leak-Tec Leak Detection Fluid (8-ounce bottle)	B5-01-3000-03-0
Disinfectant (75 single-use packets)[1]	B6-02-5000-42-0
Wescodyne Plus Cleaner, 1 gallon	B5-01-5000-01-0
Turn Around Maintenance Tags	B5-06-6000-17-0

7.17 Optional Attachments

Breathing Hose Protective Sleeve, B2-02-7001-22-0: A Kevlar sleeve that will slide over the exterior of the breathing hose to provide abrasion protection.

Hard Transit Case, B6-02-5002-63-0: An injection molded-style carrying/storage case that provides exceptional BioPak 240R storage capabilities.

Soft Transit Case, B2-02-7000-39-0: An armored cloth-style carrying/storage case that provides a shoulder strap. Soft case is smaller and lighter than hard case but will not provide the same protection or storage space as the standard hard case.

PRO Mask Hydration System, B6-02-5003-17-0**:** The Hydration System provides a 1.5-liter reservoir and an interface to the PRO facemask that will enable the user to drink liquid without breaking the breathing loop seal to the external ambient atmosphere.

AV3000 Mask Hydration System, B6-02-5002-52-0**:** The Hydration System provides a 1.5-liter reservoir and an interface to the AV3000 facemask that will enable the user to drink liquid without breaking the breathing loop seal to the external ambient atmosphere.

Harness Shoulder Pads, B2-02-7001-48-0: Constructed of flame rate materials, the pads will provide additional padding on the shoulders of the main harness.

High Pressure Digital Leak Tester, B6-02-5003-39-0: Provides a method to test the high-pressure sections of the BioPak (from cylinder valve to remote gauge and to demand housing and all connection in between) utilizing pressure decay and eliminating the use of leak detection fluid. Leak detection will be required if a leak is detected in order to locate the leak but leak detection fluid is not required for initial testing.

8. APPARATUS SPECIFICTIONS

Respirator Type:	Self-Contained, Closed-Circuit, Pressure-Demand
Respirator Duration:	Certified as entry and escape, 4-hour duration
Size:	584 x 439 x 178 mm
Weight (Fully Charged):	15.4 kg Maximum
Operational Conditions[1]:	Temperature: -5°C to 40°C Air Pressure: 900 to 1200 hPa Relative Humidity: 0 to 100%
Storage Conditions:	Temperature: 4°C to 32°C Air Pressure: 900 to 1200 hPa Relative Humidity: 30 to 100%
Oxygen Delivery:	Constant Add: 1.8 lpm Average Demand Add: 80 lpm Minimum Emergency Add: 80 lpm Minimum
Oxygen Supply:	> 99.5% Oxygen by volume < 300 ppm Carbon Dioxide < 10 ppm Carbon Monoxide 50 mg/m^3 Water Content Maximum Tasteless and Odorless 440 liter storage at 207 bar pressure
Battery:	Power: 9 Vdc Life: 200-hours or six months Type: Only the below types may be used Energizer 522 Panasonic 6AM6 Rayovac A1604 Duracell MN1604
Carbon Dioxide Scrubber:	Dual, single use “Solid-Core” canisters Non-dusting Non-settling Non-channeling
Tidal Volume:	6.0 liters

Note:

1. Operating temperature range provided above is the standard 4-hour duration with PCM installed. For extreme temperature ranges, the BioPak should be configured with ice coolers and utilized as directed below:

Ambient Temperature	**Recommended Safe Duration of Use**
41 to 60°C	1-hour
61 to 90°C	15-minutes
+90°C	6-minutes

The above temperature/duration figures are derived from human endurance limits and not from the endurance limit of the BioPak.

9. MAINTENANCE LOG SHEET

BioPak Model: BioPak 240R

BioPak Serial Number:

Date	Turnaround Maintenance	Long Term Maintenance									Comments, Benchman Signature
		Visual Inspection	Demand Valve Test	Constant Flow Test	Vent Valve Test	Low Pressure Leak Test	High Pressure Leak Test	Bypass Valve Test	Alarm Test	Maintenance Tag Validation	

(this page left intentionally blank)